PMM

Precision Metal Molding

JULY
1956

INCLUDING DIE CASTINGS MAGAZINE

EUGENE B POWERS OWNER
UNIVERSITY MICROFILMS
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devoted exclusively to:

DIE CASTINGS

INVESTMENT CASTINGS

PERMANENT MOLD CASTINGS

PLASTER MOLD CASTINGS

POWDER METALLURGY

SHELL MOLD CASTINGS

"Close tolerance die castings help cut costs on our timers . . ."

Eugene Hicks
Methods Planning Specialist
Appliance Control Dept.
General Electric Co.

See Page 3

Aluminum and Zamak

In All Standard Or Special Aluminum And Zinc Based Die Casting Alloys

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ALLOYS

You're always sure of fast trouble-free production, less scrap and lower costs when you buy from your best source of supply.

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HOT CHAMBER
Die Casting Machine

Now, for the First Time, a High Speed Process that makes it Possible to Produce Magnesium Castings at a New Low Cost!

The new Cast-Master Model-M for die casting magnesium, brings to the industry a safer, faster, more economical method for producing magnesium castings than ever before. The machine embodies the same fine features of other Cast-Master die casting machines. The "Dow type" hot end for die casting magnesium is used for metal injection. This end is similar to a zinc hot chamber arrangement thereby eliminating the disadvantage of hand ladling and making high speed production possible.

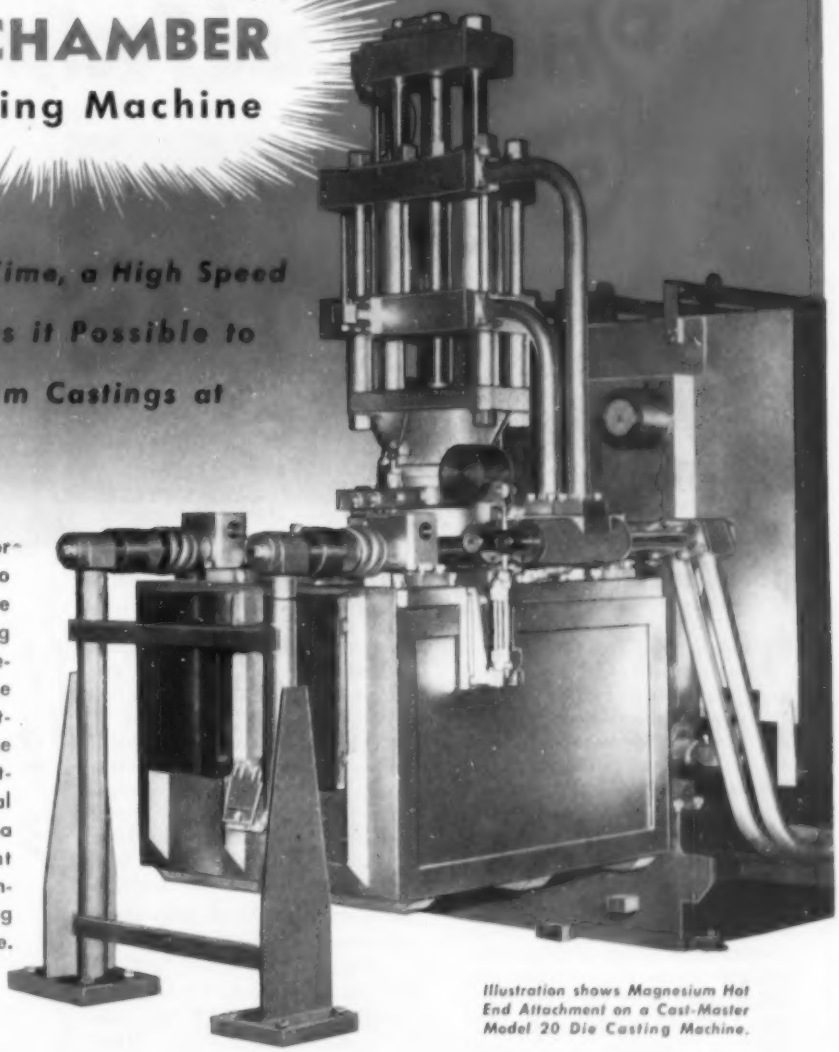
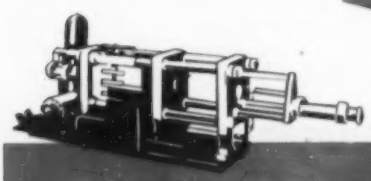


Illustration shows Magnesium Hot End Attachment on a Cast-Master Model 20 Die Casting Machine.



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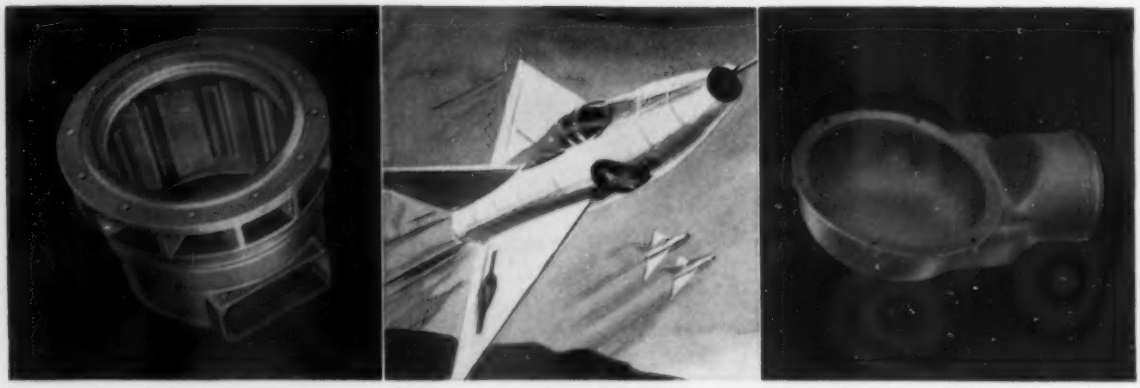
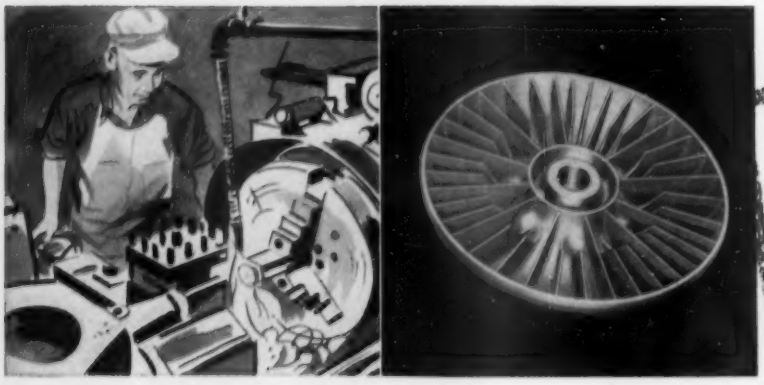


Fighters and Factories



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THE machinist turning out production parts and the pilot flying the speedy jet fighter have one thing in common—both *can count on Thompson.* The factory worker's machine and the pilot's jet engine are each improved by precision-engineered castings produced by Thompson's versatile Light Metals Division.

In the case of the fighter, it's any one of several parts including the alternator housing or an air connector used for cooling electric generators that's produced by Thompson—with the factory machine, one of the parts manufactured by Thompson is the casting for the fluid clutch.

These are but two of the many light, strong, durable castings designed, developed and manufactured by Thompson for a diversified list of customer uses. Today Thompson is producing light metal castings for such products as buses and garbage disposers; washing machines and jet planes; automobiles and industrial engines; ice scoops and aircraft engines.

Regardless of your product, if you use castings or impact extrusions, Thompson's creative engineers will gladly show you where and how you can simplify your operations and save on costs with Thompson Light Metals Castings.

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LIGHT METALS DIVISION

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COVER STORY

OPTICAL COMPARATOR is used for quality control at various stages of production on G-E appliance timers. Die cast pinions and gears help to keep reject rates low. Article begins on page 36.

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JULY, 1956 VOLUME 14 NUMBER 7

Precision Metal Molding

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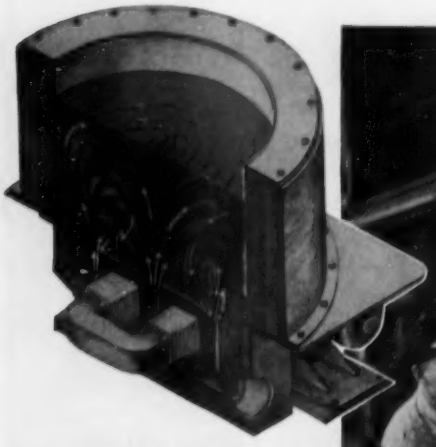
HARD-TO-MELT BRONZES SUCCESSFULLY HANDLED

in

AJAX INDUCTION FURNACES

Brass and bronze foundries all over the country have found AJAX-TAMA-WYATT induction furnaces a reliable tool for melting silicon bronzes, aluminum bronzes, leaded bronzes, phosphor bronzes, and other high strength alloys. Operation is highly economical due to the good uniformity of the alloys, low ratio of rejects, drastic reduction of metal losses, and clean operating conditions. This recent development opens the field for the use of AJAX induction furnaces in all foundries where difficult-to-melt alloys are handled.



Cross section of AJAX-TAMA-WYATT twin coil induction furnace such as used at the Torrance Brass Foundry. Heat is produced within the molten metal in the secondary channels and conveyed throughout the melt by electromagnetic circulation, resulting in minimum metal losses and high uniformity of alloy. Temperature is automatically controlled.

Photograph courtesy of Long Beach Press-Telegram, Long Beach, Cal.

The furnace pictured above is melting aluminum bronze at the **Torrance Brass Foundry, Torrance, Cal.,** operating at a temperature of 2400 F, for the production of high strength centrifugal castings. This unit is rated 100 kw. Note also the clean, smokeless operation as shown in the unretouched photograph.

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AJAX

INDUCTION MELTING FURNACE

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AJAX ELECTROTHERMIC CORP., Ajax Northrup High Frequency Induction Furnaces
AJAX ELECTRIC CO., The Ajax Hultgren Electric Salt Bath Furnace
AJAX ELECTRIC FURNACE CORP., Ajax Wyatt Induction Furnaces for Melting

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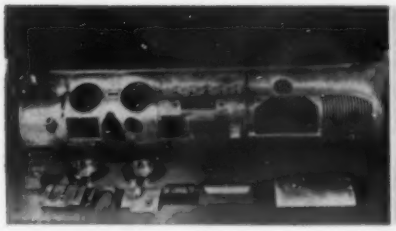
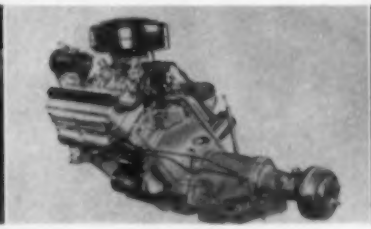
CASTING ABOUT

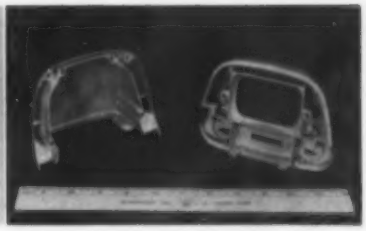
technical news of applications & processes involving precision metal moldings



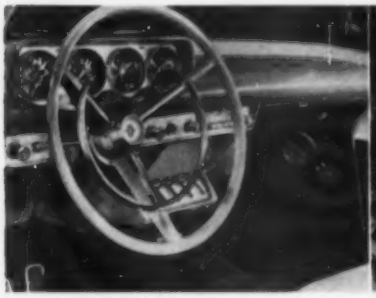
CHRYSLER New Yorker and Windsor have this zinc 22-pound die cast instrument panel which is in three sections. Other die castings are fixed to the panel.



CHRYSLER Powerflite transmission employs a large number of aluminum die castings, many of them load carrying components, as is revealed in this view. Two main castings weigh 15 pounds.

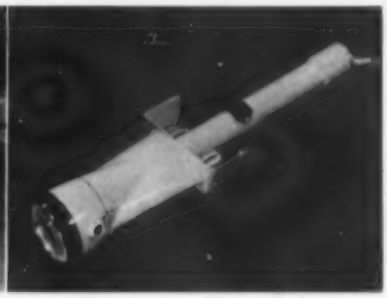


STUDEBAKER features interchangeable instrument panels for left and right hand drive cars for both U.S. and export markets. Interchangeable die insert makes this possible.



FORD CONTINENTAL Mark II uses a number of zinc die castings for this handsome instrument panel assembly. In addition, radio grille and control knobs are die cast.

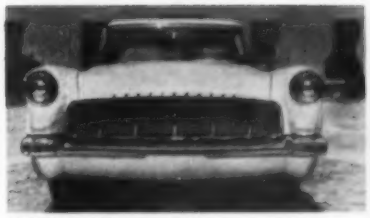
RAMBLER die cast grille assembly is simplified by stud inserts cast in back of grille and molding. Grille is shown here being attached to sheet metal frame before mounting onto car.



OLDSMOBILE steering column shroud is built of magnesium die castings for lower weight and less vibration. This cantilever beam consists of four die castings.

GREATER PENETRATION INTO AUTOMOTIVE CONSTRUCTION by die cast components has been reported in a survey just completed by the American Die Casting Institute. In 1955 and again in 1956, the number of individual die cast parts used in all sections of American passenger cars has reached record proportions. Last year job shop die casters delivered to the automotive industry 327 million pounds of zinc die castings and 117 million pounds of aluminum die castings. This compares with previous highs of 173 million and 57 million pounds, respectively.

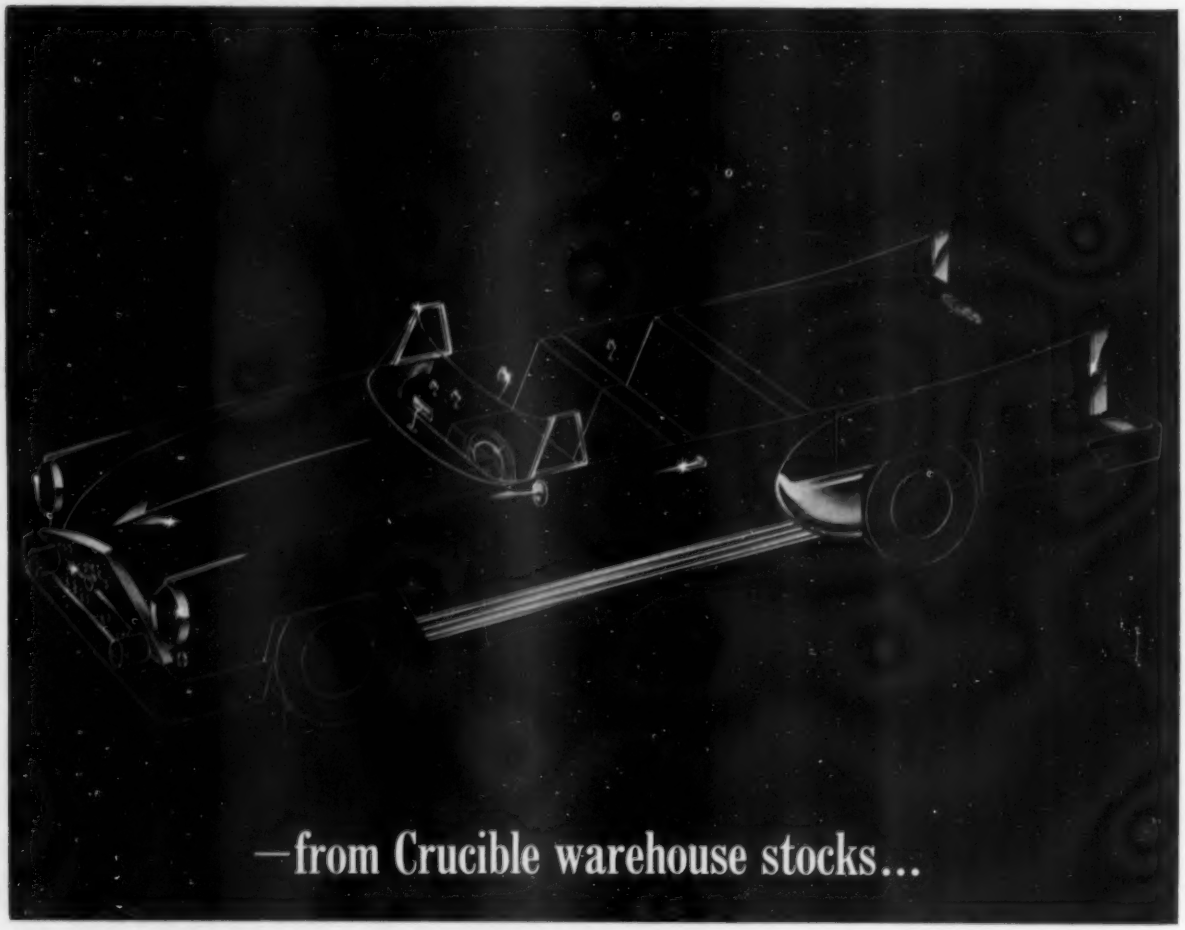
Automatic transmissions in practically all cars, but especially in the low price, high volume models, utilize torque converter housings made of aluminum die castings. Most stators are also die cast aluminum. Example: the automatic transmission built for the 1956 Studebaker President by Warner Gear Division of Borg-Warner has 17 die cast aluminum parts weighing almost nine pounds. Example: Some larger cars, such as Chrysler and Buick, have torque converter housing which weighs as much as ten pounds alone. Two aluminum die castings in Chrysler's new Power-Flight automatic transmission are the housing and extension which, together, weigh 15 pounds . . . a weight saving of up to 36 pounds. Examples: Ford's impeller housing, 10 pounds; Cadillac's bell housing and drive shaft, 12 and 6 pounds respectively; Chevrolet's PowerGlide assembly with die cast stator and valve bodies.



You'll see them coming . . .

and going

Continued on page 8



ultrasonically inspected CSM 2 DIE CASTING DIE STEEL

for auto trim

Like so many other automotive trim and hardware dies, Crucible CSM 2 was selected from warehouse stock for this long-run grill die. Built from a prehardened 25" x 15" bar, it produced 341,598 parts during the model year, and is now used for replacement parts.

Die by Valor Tool and Machine Co., Dearborn, Mich.

Like all Crucible die steels, it was ultrasonically inspected. This assures you of sound die steel quality – every time. It's a big reason why CSM 2 . . . and its partner for aluminum die casting, NU DIE V . . . are so popular that they're stocked in more than 430 sizes in Crucible warehouses from coast to coast. These sizes range from 1" to 40" wide . . . ¾" to 15" thick – and can be cut to your specifications at the warehouse.

For your die steel requirements – for holder blocks, solid dies, inserts or sleeves – you'll get *fast* delivery, sound quality from your local Crucible warehouse. *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

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Crucible Steel Company of America

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"We're glad we got into die casting. We've effected tremendous savings in this brand new department with the five Lesters we have running. And they're doing a swell job. For instance, the HP-1-Z has been running almost continuously since the day it was installed 12 months ago.

"Yes, we are very happy with our Lesters...and our future expansion plans include more of them."

So says Sy Olanoff, plant manager of Lewyt Air Conditioner Corporation in Brooklyn, New York.

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of
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CASTING ABOUT

continued from page 5

Functional Parts. Among the functional elements now die cast may be listed all important parts of the carburetor assembly, a variety of ignition components, windshield wiper parts and many elements in heaters and air conditioners.

Interior Parts. Integration of decorative and functional elements has led to an increased use of die cast zinc in auto interiors. Particularly noteworthy are the die cast instrument panels such as Cadillac's 11-pound panel. Many associated parts, grilles, bezels, knobs, sub-assembly parts, steering column collars, etc., perform not only functional, but also decorative service.

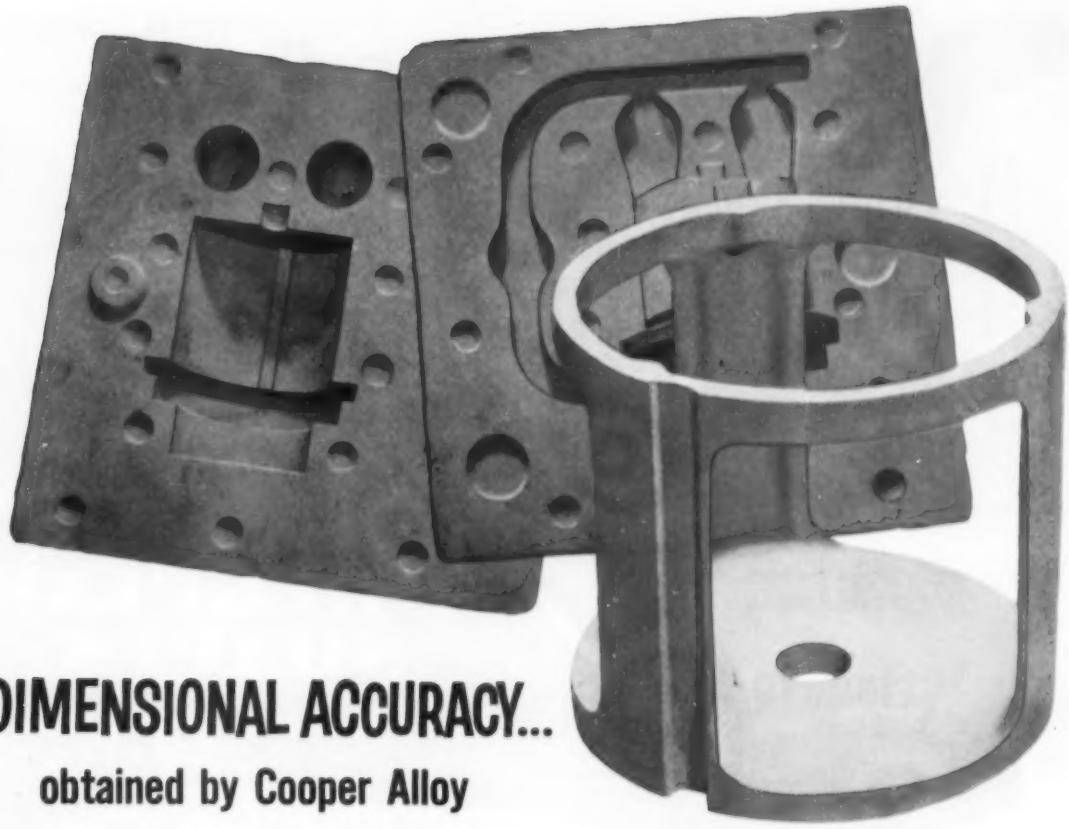
Exterior Trim. While 1955 saw a significant swing to die cast exterior components, 1956 will shatter all records for number and weight of castings used. Front grilles probably represent the largest castings both in area and weight, while decorative elements have become larger and more elaborate. Deck lock assemblies, expanded tail light bezels to include also back-up and directional lights, and side mouldings all represent large uses of die cast zinc with chromium final plate.

ANODIZED COATINGS FOR ZINC DIE CASTINGS will be the subject of a research project at Battelle Memorial Institute, commissioned by the American Zinc Institute. Covering improved finishes for zinc die castings, including work on anodizing and dyeing, as well as improvements in plating practices. According to John L. Kimberley, executive vice president of the Institute, committee consists of E. A. Anderson of New Jersey Zinc Co. of Pennsylvania, A. A. Smith of American Smelting & Refining Co., R. C. Bell of Consolidated Mining & Smelting Co. of Canada, Ltd. Advisors will include M. R. Caldwell of Doehler-Jarvis Div. of National Lead Co. and Myron Diggin of Hanson-Van Winkle-Munning Co.

TINIEST PLIERS are die cast in zinc. They come from the die as a completely hinged, workable assembly. Gries Reproducer Corp. of New Rochelle, N.Y., who produce these midget die castings as a demonstration of their Intercasting process, also use this unique die casting system to produce loose leaf binder rings, continuous link chain and other special products. These die cast pliers, although mainly a novelty, will actually cut light wire. Gries will be glad to send you a sample of these tricky little pliers. Drop a note to PMM and the request will be forwarded.

PLAIN FACTS ABOUT TWO METALS are contained in a pair of booklets published in the past few weeks by two organizations in the metal working industry. The American Zinc Institute has published a 16-page brochure containing a review of the zinc industry 1955. Prepared by Ernest V. Gent, it offers a detailed analysis of supply and usage. It is available free from the American Zinc Institute, 60 E. 42 St., New York City. On the other hand, the new booklet published by the American Electroplater's Society is entitled, "Nickel Story" and contains not only a statistical study of the world and domestic nickel situation, also statements by several men in the field. This piece can be bought for 50c from the AES at 445 Broad St., Newark, N. J.

PHOTO-SENSITIVE PIGMENT PAINT for tomorrow's automobiles is foreseen by Del S. Harder, executive vice president of Ford Motor Company's basic manufacturing divisions, who told a forum in Michigan recently, "Our research people can picture all cars shipped to the dealer from the factory being a neutral white. Any color, or combination of colors, that his customer wanted would then be brought about by playing a controlled electro-magnetic radiation gun over the neutral white paint . . . . This paint would almost be self-cleaning. It would have the ability to expel dust and dirt from its surface when passed through an energy field."



DIMENSIONAL ACCURACY...

obtained by Cooper Alloy

through SHELL MOLDING with G-E Shell Molding Resins

This stainless steel instrument housing, cast for a customer by Cooper Alloy Corporation, Hillside, N. J., was one of those "impossible" jobs. Previous experience by the customer had resulted in shrink defects in the lugs on the open face, rendering the castings unacceptable. The job was further complicated by the fact that dimensions and finish were equally critical on both exterior and interior surfaces.

Through shell molding and advanced foundry techniques, Cooper Alloy was able to convert this "impossible" job to a standard production run! Hollow shell cores achieved the required accuracy and finish for the casting's interior; the Shellcast* process accomplished similar results for the exterior. G-E shell molding resins helped Cooper Alloy obtain close dimensional accuracy, fine finish and uniform soundness.

How can shell molding help YOU?

Cooper Alloy uses *General Electric shell molding resins* in its Shellcast process, relying on them for batch-to-batch uniformity and correctly balanced properties. Other G-E products for shell molding include: *G-E silicone release agents* to release molds easily from patterns and *G-E phenolic bonding resin* to assemble shell halves together.

Progress Is Our Most Important Product

GENERAL ELECTRIC

Ask G.E. about shell molding!

General Electric maintains a shell molding laboratory in Pittsfield, Mass., to help users and prospective users of shell molding solve problems and evaluate the process. G.E. also offers a 28-page manual describing the techniques and benefits of this new foundry method. *Just mail the coupon for a free copy!*

*Reg. trademark, Cooper Alloy Corporation

FREE SHELL MOLDING MANUAL!

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Section 6F4C1
Chemical and Metallurgical Division
Pittsfield, Massachusetts

Please send me a free copy of *G-E Shell Molding Manual.*

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Skilled in Die Casting Mechanics • Experienced in Lubrication Engineering • Originators of Really High Speed Air Tools

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CASTING ABOUT

continued from page 8

COURSE IN INVESTMENT CASTING is being offered later in the year under the sponsorship of the Investment Casting Institute. The intensive 6-day course will be conducted at University of Michigan's Cast Metals Laboratories under the direction of Dr. Richard A. Flinn, and will include lectures and experimental work in the following subjects: investment materials; gating and risering; melting, refining and degassing; properties of heat resistant alloys; new techniques and developments; and a seminar on precision casting methods.

Needless to say, the attendance, which was limited to 40 individuals, was completely subscribed immediately by ICI members, who had first priority to attend the course. It will take place Sept. 10-15, and is expected to be followed in 1957 with another course at Massachusetts Institute of Technology.

$1½ MILLION DIE CASTING PLANT of the Aluminum Company of America will be built on a 57-acre site in Edison Township, N. J. Construction is to start within one year, completion within three. The new building, with 200,000 sq. ft., will replace the company's Garwood plant which has been operated since 1922. According to Charles G. Wistar, works manager at Garwood, the present work force of 750 will be able to continue in their jobs in the new plant. Inability to enlarge the Garwood plant is given as the reason for the move.

CREEP BEHAVIOR of titanium at elevated temperatures will be part of the study to be conducted for Boeing Airplane Co. by Cornell Aeronautical Laboratory, Inc., Buffalo, N. Y. A new titanium alloy with six parts aluminum, four parts vanadium, will be tested.

CERAMIC COATINGS will be a key material in the nuclear and supersonic era, according to Robert A. Weaver, Jr., president of Bettinger Corp. who told a management conference recently that ceramic coatings can withstand temperatures and stresses that often destroy metals. Bettinger, he said, has been applying ceramic coatings to such units as turbosupercharger nozzle boxes, intercombustion liners and afterburner interliners, exhaust and collector rings.

There's safety in these numbers

UCON Brand Hydrolube 200-N
(Viscosity—approx. 200 S.U.S. at 100° F.)

UCON Brand Hydrolube 300-N
(Viscosity—approx. 300 S.U.S. at 100° F.)

UCON Brand Hydrolube 550-N
(Viscosity—approx. 550 S.U.S. at 100° F.)

Yes, there's safety in the three standard viscosity grades of UCON Hydrolubes—CARBIDE's safety hydraulic fluids.

Safety for men and property

- The resistance of UCON Hydrolubes to burning has been proved by years of severe, exhaustive testing in the laboratory. AND, *in actual service*, UCON Hydrolubes have prevented serious fires and injury during their more than 8 years of routine use. UCON Hydrolubes are water-base hydraulic fluids—the water content is the key to their non-flammability.
- And, for all practical hydraulic purposes, UCON Hydrolubes are non-toxic to workmen.

Safety for machines

UCON Hydrolubes

- Have no harmful effects on packings and seals. Leakage losses are often lower than with other hydraulic fluids.
- Contain effective liquid and vapor phase corrosion inhibitors for the common metals.
- Have good lubricity. Special anti-wear agents provide satisfactory pump life and performance characteristics.
- Have high viscosity indexes—150 to 160.
- Have low pour points—can be used at sub-zero temperatures.
- And, are made in the three standard viscosity grades—others can be supplied to fit specific requirements.

For safety's sake, get all the facts. Write *today* for the booklet, "UCON Hydrolubes," Form 7380.

CARBIDE AND CARBON CHEMICALS

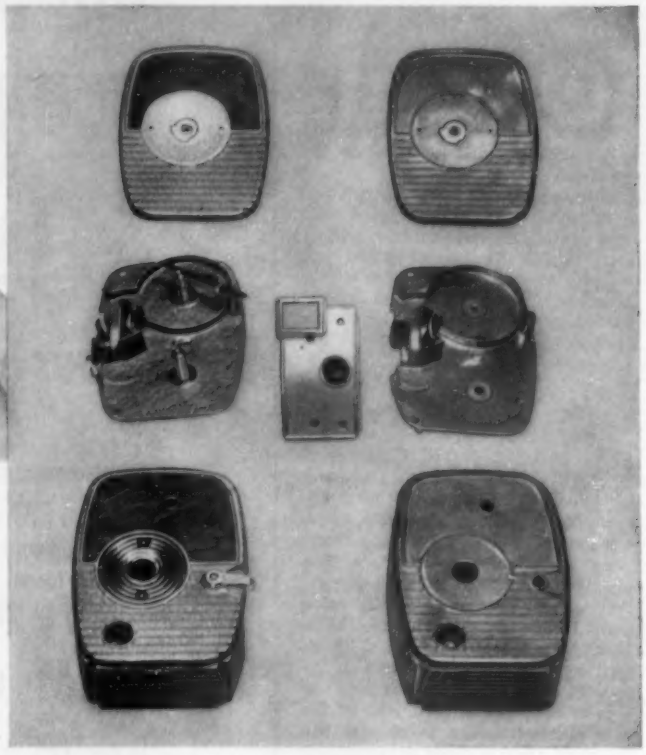
CARBIDE AND CARBON CHEMICALS COMPANY
A Division of Union Carbide and Carbon Corporation
30 East 42nd Street UCC **New York 17, N. Y.**

"Ucon" is a registered trade-mark of Union Carbide.

For more information circle No. 21 on the Reader Service Card

DIE CASTING REPORT

Contours, clever design and weight saving... attract light industry



The photographic industry, long a user of aluminum die-castings, is daily finding more ingenious ways of using this cost-and-weight saving process. Look at this Keystone 8 mm Capri movie camera. (1) A cast groove in the cover provides a positive light seal—almost impossible to achieve economically by other processes; (2) the mechanism plate features a cast film guide, a governor housing and cored holes which all simplify and speed assembly; (3) much machining is eliminated by cored holes and part has buffed finish for customer chrome plating, and (4) exceptionally smooth finish on case plus streamlined appearance and detail were possible only with die-castings.

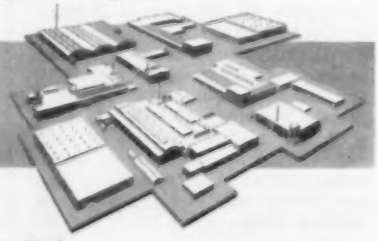
Clever engineering and major use of die-castings enable Keystone to produce a quality, precision camera at a price designed to attract volume sales.

Lawn Spray Nozzle Three core pulls, a 2 impression die, and a production of close to 300,000 zinc units per season. That's the story of this complicated little die-casting. Machining included punch press parting line, facing nozzle end and seat, reaming core flash at junction of two cores, facing hose connection, drilling one pin or shaft hole, and tapping hose thread and plunger cylinder end. All operations done by Precision. An example of perfect integration.

Write on your letterhead for a copy of "Die-Castings...Unlimited." Address: Precision Castings Co., Walnut St., Fayetteville, N. Y.

PRECISION CASTINGS CO.

A DIVISION OF **HARSCO Corporation**



FAYETTEVILLE, N. Y.—SYRACUSE, N. Y.—CORTLAND, N. Y.—NEW YORK, N. Y.
CHICAGO, ILL.—CLEVELAND, OHIO—KALAMAZOO, MICH.

For more information circle No. 44 on the Reader Service Card

CONTROL !

CRUCIBLE MELTING ALLOWS CLOSE AUTOMATIC TEMPERATURE CONTROL ESSENTIAL TO PRODUCTION OF HIGH QUALITY CASTINGS

CRUCIBLE MELTING

For Permanent Mold and Die Castings

Crucible furnaces for melting and holding aluminum furnish clean metal at lowest investment and minimum operating costs.

CRUCIBLES FOR CONTROL

CRUCIBLE MANUFACTURERS ASSOCIATION

20 WEST 43RD STREET, NEW YORK 36, N. Y.

THESE FIRMS CAN TAKE CARE OF ALL YOUR REQUIREMENTS FOR CRUCIBLE MELTING

LAVA CRUCIBLE-REFRACTORIES CO.
AMERICAN REFRACTORIES & CRUCIBLE CORPORATION
JOSEPH DIXON CRUCIBLE CO.
VESUVIUS CRUCIBLE CO.
ELECTRO REFRACTORIES & ABRASIVES CO.
ROSS-TACONY CRUCIBLE CO.

Have you seen the new "'CRUCIBLE CHARLIE' says . ." leaflets issued by Crucible Manufacturers Association? If not, ask your superintendent about this. He has a copy.

For more information circle No. 18 on the Reader Service Card

CORE BOX INSERTS OF BERYLLIUM COPPER HELPED THE LEBANON STEEL FOUNDRY BOOST PRODUCTION AN ALMOST UNBELIEVABLE 1400%... COST OF EACH CORE WAS CUT 70%

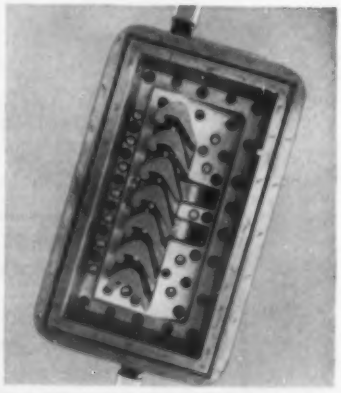
The first core box with beryllium copper inserts, made 4 years ago, has turned out 20,000 cores so far and is still in excellent condition! Reports Lebanon, "We may get 20,000 more cores blown out of that box, maybe 40,000, or even 60,000. There seems to be no end to the amount of wear the beryllium copper inserts will take."

In order to mass produce intricate armored steel louver castings for Army tanks, Lebanon purchased two coreblowing machines. The core box design, however, created very severe wear conditions for the metal inserts used. The space between the blades in the core box was only ¼ in., and to form the sand completely in these narrow spaces, blow holes had to be drilled in the core box between each blade. With a hole diameter of ⅛ in., there was left only 3/16 in. clearance between the hole and the blade on each side.

The erosive force of the sand blasted through the blow holes under a pressure of 90 psi dished out bellies and chipped the aluminum and chromium plated iron inserts after a production run of only 500 cores. These eroded spots made it impossible to eject the core from the box. Tolerances were completely lost . . . the coremaking machine had to be shut down, the core box dismantled and sent to the pattern shop. Sometimes weeks of valuable production time was lost.

Since 1952, Lebanon has been using "BERYLCO" brand beryllium copper core box inserts—of the original 244 beryllium copper inserts purchased, every single one is still serviceable. Shutdown time due to core box repair, and the wasted labor and time in clerical work, transportation, and reconditioning, have been eliminated.

A technical bulletin describing in greater detail the use of beryllium copper inserts in core boxes, and an all-new castings catalog listing the various "BERYLCO" beryllium copper alloys, their physical properties and casting advantages, will be sent to you upon request. Write today.



Most of the core boxes run about 16 x 8½ x 6½ in. Each blade has .015 in. draft per side. The body of the box is constructed of aluminum with steel facing, and weighs approximately 75 lb. when assembled, including the beryllium copper inserts.

THE BERYLLIUM CORPORATION
Tuckerton Road • Dept. 6-G • Reading 7, Pennsylvania

For more information circle No. 12 on the Reader Service Card

A Bolt from the Blue!

THE *NEW* STROMAN ELECTRIC RESISTANCE FURNACE

Accept this introduction to another new Stroman Furnace that will further facilitate the speedy production of aluminum castings for all die casting and permanent mold plants. Designed for holding only with a hot charge, it assures perfect metal and is exceptionally cool to work with. It has many exclusive and labor as well as cost saving features. Here are just a few of them.

- Absolute Quiet Bath—No Turbulence
- Extremely Low Dross Formation
- No down time
- Low heat input—greatest fuel conservation
- Resistance elements can be replaced while furnace is in operation
- Metal can be carried overnight or over week-end without damage or appreciable loss
- Absolutely noiseless in operation
- Bath capacities 500-800-1500 lbs.
- Maximum aluminum temperature 1550°
- Completely Automatic Safety and operating controls
- Complete Package Unit consisting of Control Panel . . . Transformer and Furnace is delivered ready to operate on 220V or 440V—3 phase 60 cycle AC
- If furnace freezes due to power failure or cools, charge can be reheated and melted out without any damage to furnace
- Lining is made of standard brick shapes available at any local source. This eliminates cost of special shapes or ramming materials
- While linings last for years, if replacement is necessary it is easily accomplished for everything is readily accessible. New linings can be dried out with regular heating unit
- This New Stroman Electric Resistance Furnace can be supplied with an AUTOMATIC LADLING DEVICE if desired
- Remember . . . no pots to leak or replace . . . and it occupies considerably less floor space than gas or oil furnaces

GET ALL THE FACTS . . . PHONE, WIRE OR WRITE TODAY!

STROMAN
FURNACE & ENGINEERING CO.
DIVISION OF
THE PETERSEN OVEN CO., FRANKLIN PARK, ILL.

For more information circle No. 69 on the Reader Service Card

DATA OFFERED IN THIS MONTH'S ADS

the Reader Service Cards on the facing page will get you these free reference materials. Circle the numbers and mail.

1. **1000 Shots Per Hour**—according to bulletin A-10, an engineering report on small die casting machines, from ABC Die Casting Machine Co.

3. **Colloidal Dispersions For Casting**—Bulletin 425 from Acheson Colloids Co. describes the different dispersions available for foundry use.

5. **Alloy Metal Powders**—The use of these powders in the fabrication of parts and the properties of the parts made from them are covered in detailed reports from Alloy Metal Powders, Inc.

8. **Die Casting Alloys**—A new booklet "Die Casting Alloys" has been issued by Apex Smelting Co. Mechanical and metallurgical properties of the as-cast alloys are given.

10. **Die Casting Machine Specifications**—The complete specifications on the different models of die casting machines now being built are given in literature from B & T Machinery Co.

12. **Beryllium Copper Castings & Inserts**—Two new bulletins describing the use of beryllium copper inserts in core boxes and a catalog listing beryllium copper alloys are available from The Beryllium Corp.

13. **Precisely Controlled Alloys**—Vacuum or air melted alloys for all casting, rolling, forging or extruding uses are discussed in the new bulletin now available from Cannon-Muskegon Corp.

16. **Bearing Stock List**—A new stock list enumerating 1085 standard Oilite bronze bushings has been issued by the Amplex Div., Chrysler Corp.

17. **Production of Small Die Castings**—The rapid production of small die castings, at rates up to 1000 per hour, is possible on The Cleveland Automatic Machine Co.'s new model described in Bulletin 50.

18. **"Crucible Charlie"**—The commentator in a series of leaflets published by the Crucible Manufacturers Association, outlines important facts about melting crucibles.

21. **Safety Hydraulic Fluids**—In a new booklet, Form 7380, the uses and properties of the different Hydrolubes are discussed. Copies can be secured from Carbide & Carbon Chemicals.

22. **Sprue Bushings & Spreaders**—Complete specification sheets giving all of the uses and advantages of specially designed, longer wearing sprue bushings and sprue spreaders are available from Detroit Mold Engineering Co.

26. **Alloys For Die Casting**—Informative technical and engineering information has been compiled by the Federated Metals Div., American Smelting & Refining Co. about alloys specifically for the die caster.

27. **Shell Molding Resins**—A 28 page manual has been prepared by General Electric Co. on the techniques and benefits of shell molding foundry practices.

29. **Brass & Aluminum Die Castings**—A brochure has been published by Hampden Brass and Aluminum Co. that gives details about the experience, facilities and equipment of the company.

30. **Fluxes For Aluminum Or Zinc**—A technical bulletin giving important information on fluxing procedures and improved shop practice has been issued by the Haviland Products Co.

31. **Casting Alloys**—A booklet giving new and pertinent material on all of the alloys available from Henning Bros. & Smith, Inc. has been prepared. Suggestions on how to get the best results in casting particular alloys are included.

32. **Die Castings**—A booklet, "Hoover Die Castings", gives much valuable information to the designer and production man concerned with the specification and use of die castings. Copies may be obtained from The Hoover Co.

33. **Die Casting Machines**—A new illustrated catalog from the Kux Co. gives all of the specifications and much operating data on the entire line of die casting machines.

37. **Melting Furnaces**—An improved electric resistance furnace for melting aluminum, magnesium, zinc and lead is described in bulletin no. 321 from Lindberg Engineering Co.

38. **Designing Die Castings**—A booklet on design of parts to be die cast has been prepared by Litemetal Dicast, Inc.

40. **Packaged Conveyors**—Complete information is available from May-Fran Engineering, Inc. on how to build up special conveyor systems from standard, stock components.

43. **Plaster Mold Castings**—A brochure from Ohio Precision Castings, Inc. describes the savings that are possible by casting small parts in plaster molds.

45. **Stainless Steel Plunger Rings**—A special bulletin has been issued by Precision Piston Rings, Inc. on the properties and advantages of their stainless steel plunger rings.

46. **Die Casting Machines**—Complete specifications on all sizes and types of die casting machines made by the company are available from Reed-Prentice.

47. **Technical Data**—Republic Steel Co. has available technical data on their iron powder. Data on the powder, green compacts and sintered compacts are given.

48. **Metal Purifying Fluxes**—A group of technical reports and brochures have been prepared by the Rossborough Supply Co. on the fluxing of molten metal to give clean, grain refined cast metal.

50. **Presses for Metal Powders**—A series of three bulletins has been issued by the F. J. Stokes Corp., "Powder Metallurgy Today", catalog no. 801 on powder metal presses and bulletin no. 670 on model 640 press.

59. **Finishing Non-Ferrous Metals**—The application of Iridite chromate conversion finishes to non ferrous metals is discussed in literature available from Allied Research Products, Inc.

60. **Barrel Finishing**—A new catalog on Almco Sub-O-Matic process of small parts finishing is now available from the Almco Div. of Queen Stove Works, Inc.

61. **Powered Drill Press Feeds**—Bulletin no. 22, published by Becket-Harcum Co., Inc. discusses their full line of air powered drill press feeds.

62. **Special Air Valves**—Air valves with built in speed controls are featured in bulletin BA-101R from The Bellows Co.

Continued on page 18

for small die castings . . .

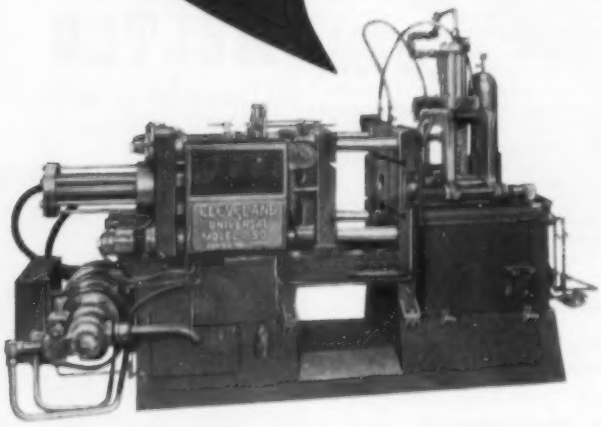
you'll get profitable production from this fast, efficient, low cost

CLEVELAND
Model 50

For small die cast parts, you can depend upon the Cleveland Model 50 Universal Hydraulic Die Casting Machine to give you *profitable* production — on high volume runs or short runs where the die investment can be low.

Very economically priced, the Cleveland Model 50 is designed and engineered to provide every essential to insure precision-quality castings at a high rate of speed. The Model 50 will free cycle at over 1000 times per hour. Tie bars, toggle links, pins, platens are of extra-heavy, rigid construction. Automatic electric timing of the cycle is a part of the standard control system. Hydraulic controls are provided for core pulls. High injection speed and pressures assure sound, dense, *"hardware"* finish castings.

Detailed information on these and many other Cleveland-quality features is given in Bulletin No. 50, which also describes the next size larger, Model 100, Cleveland Die Casting Machine. Write for your copy today. Better still, arrange now to discuss your die casting machine requirements with the Cleveland Automatic Sales Engineer in your area. There is no obligation.



Cleveland Model 50 Universal Hydraulic Die Casting Machine. Converts from zinc, tin or lead casting to aluminum, brass or magnesium casting by simply changing the hot-metal shot end. Size of die plates: 18¾" x 22". 50-tons locking pressure. Similar in construction to machine shown above is the Cleveland Model 100 Die Casting Machine which has 22½" x 24½" die plates, 100-tons locking pressure.

Write for Bulletin 50

THE CLEVELAND AUTOMATIC MACHINE COMPANY

4952 Beech Street
Cincinnati 12, Ohio

SALES OFFICES: CHICAGO
CLEVELAND • DETROIT
HARTFORD • S. ORANGE

Manufacturers of a Complete Line of Single Spindle Automatic Screw Machines and High Pressure Hydraulic Die Casting Machines

For more information circle No. 17 on the Reader Service Card

DATA IN ADS

continued from page 16

63. Low Cost Finishing—The advantages of barrel finishing to give hand-buffed results at barrel finishing costs are given in "Facts and Figures Report on Honite Barrel Finishing" from Minnesota Mining & Mfg. Co.

65. Metal Cleaning—A booklet has been prepared by Oakite Products, Inc. giving detailed information on metal cleaning, especially applicable to the aircraft industry.

66. Blast Finishing—How to cut finishing costs through the use of the Hydro-Finishing process is described in bulletin 1402 from the Pangborn Corp.

67. Automatic Tapping Heads—How to reduce tapping costs is told in a new brochure that has been prepared by Procunier Safety Chuck Co. The full construction details of their tapping heads are shown.

69. Pilot Plant Casting—In a new bulletin, DB-52-500, Westinghouse Electric Corp. discusses the facilities for pilot plant casting production and prototype manufacture in the new metals plant.

72. Small Die Cast Parts—Five separate bulletins are available from the Gries Reproducer Corp. on small zinc die castings, plastic parts and industrial fasteners and stock parts.

FORM ARROW SHELL CAST

After seven years of shell molding The Arrow Pattern & Engr. Co. announces the construction of a new plant to be located in Erie, Pa. on Nagle Road. This plant was scheduled to be ready for operation on July 1.

The foundry division will be known as Arrow Shell Cast. The shell mold foundry will produce shell castings in both aluminum and copper alloys.

ADDRESSES MEETING

Ernst J. de Ridder, director of engineering development for Reynolds Metals Company, presented a technical paper at the Third International Light Metals Congress in Leoben, Austria, held June 7 through June 9.

Attending the meeting were some 500 representatives of the light metals industry from the United States, England, France, Austria, Italy and Switzerland.

Our facilities are open...

to your inquiries about Cannon-Muskegon

VACUUM-MELTED

UltraMet alloys and service

WHATEVER your metallurgical problem, Cannon-Muskegon is equipped and staffed to solve it. Our metallurgists can make the *right vacuum-melted* alloy to fit your need. We can develop and test it in the ultimate in modern research and testing laboratories . . . then produce it to specifications in our modern plant. What's more, Cannon-Muskegon recommends proper handling methods for best results in your application.

In addition, Cannon-Muskegon offers a wide range of ferrous-, nickel- and cobalt-base alloys for your specific needs. These super-clean alloys are poured at pressures from 1 to 10 microns — available in sample or production quantities . . . in cast billets or ingots. Vacuum-melted alloys offer cleaner, smoother surfaces . . . greater tensile strength, ductility and wear life . . . higher electrical and magnetic properties. For complete vacuum-melting service, see Cannon-Muskegon.

Now available are:

- ***Materials for remelt*** — under conventional air melting, inert gas, vacuum.
- ***Casting development*** — includes research and experimental facilities for investment, shell mold, dry sand, and permanent mold castings.
- ***Ingots or cast billets*** — for rolling, forging or extruding in individual weights up to 250 pounds.

ULTRA MET
VACUUM-MELTED ALLOYS
FOR INDUSTRY

For full particulars write for our New Bulletin on Vacuum-Melting and Air-Melting facilities and products.

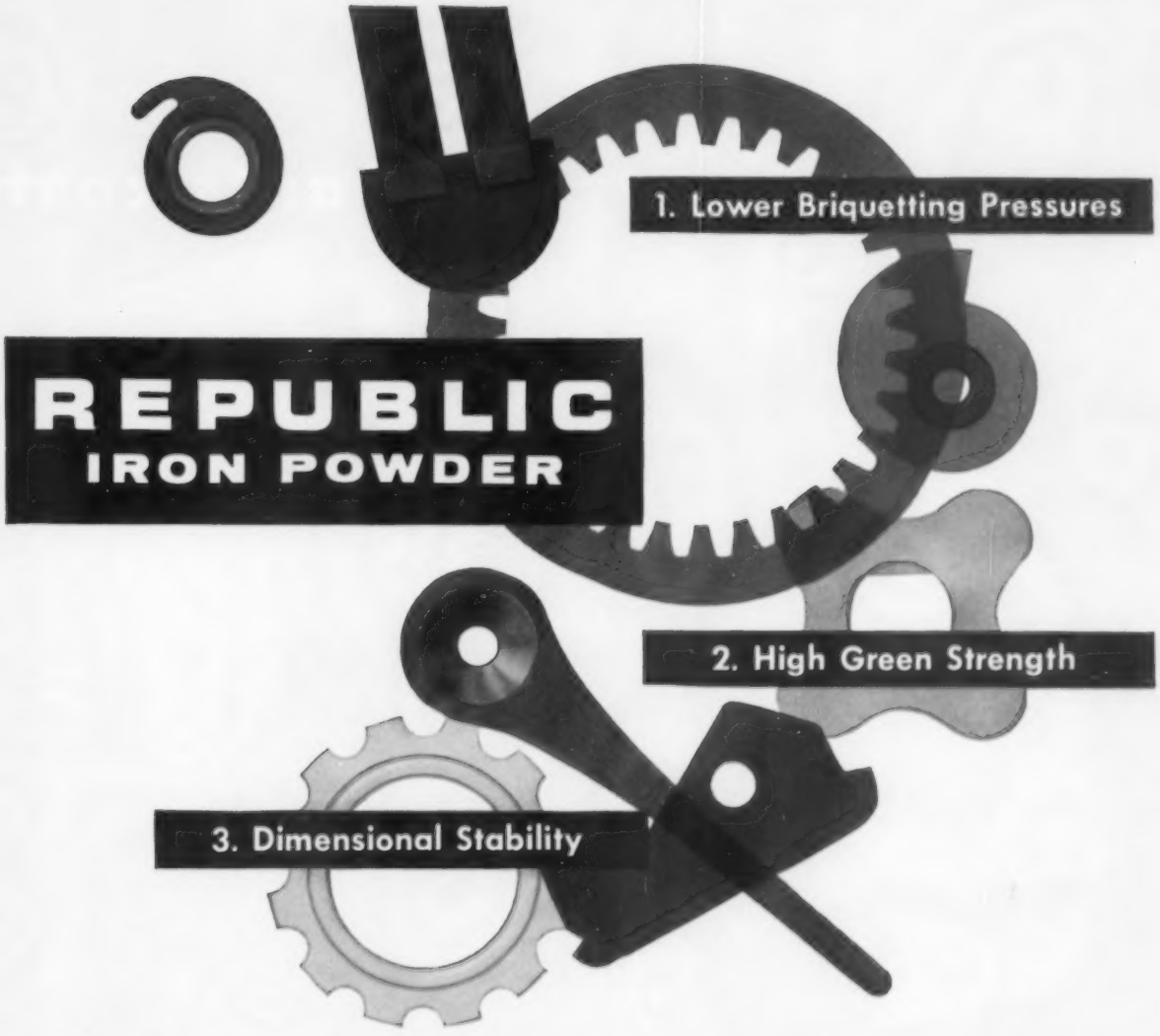
MODERN RESEARCH facilities and experts are at your service. Constant research with known alloys develops our abilities . . . to your advantage. We are now testing alloys containing boron, aluminum and titanium . . . with interesting results. Send us your problems.

CANNON-MUSKEGON CORPORATION

2871 Lincoln Street Muskegon, Michigan

METALLURGICAL SPECIALISTS

For more information circle No. 13 on the Reader Service Card



These features of Republic Iron Powder help simplify processing and handling—help you hit design goals of projected or production items. Special qualities of the base material and Republic's preparation process assure a consistently uniform powder from lot to lot. Particle size distribution and apparent density are carefully controlled. Acceptable limits on flow rate, hydrogen loss and chemical analysis have been established.

Our metallurgists and engineers are available to assist you in producing more uniform parts at minimum cost with Republic Iron Powder. Send the coupon for more information.

REPUBLIC

STEEL

World's Widest Range

of Standard Steels and Steel Products

REPUBLIC STEEL CORPORATION
3192 East 45th Street
Cleveland 27, Ohio

☐ Please send more information on Iron Powder
☐ Have an engineer call.

Name_____ Title_____

Company_____

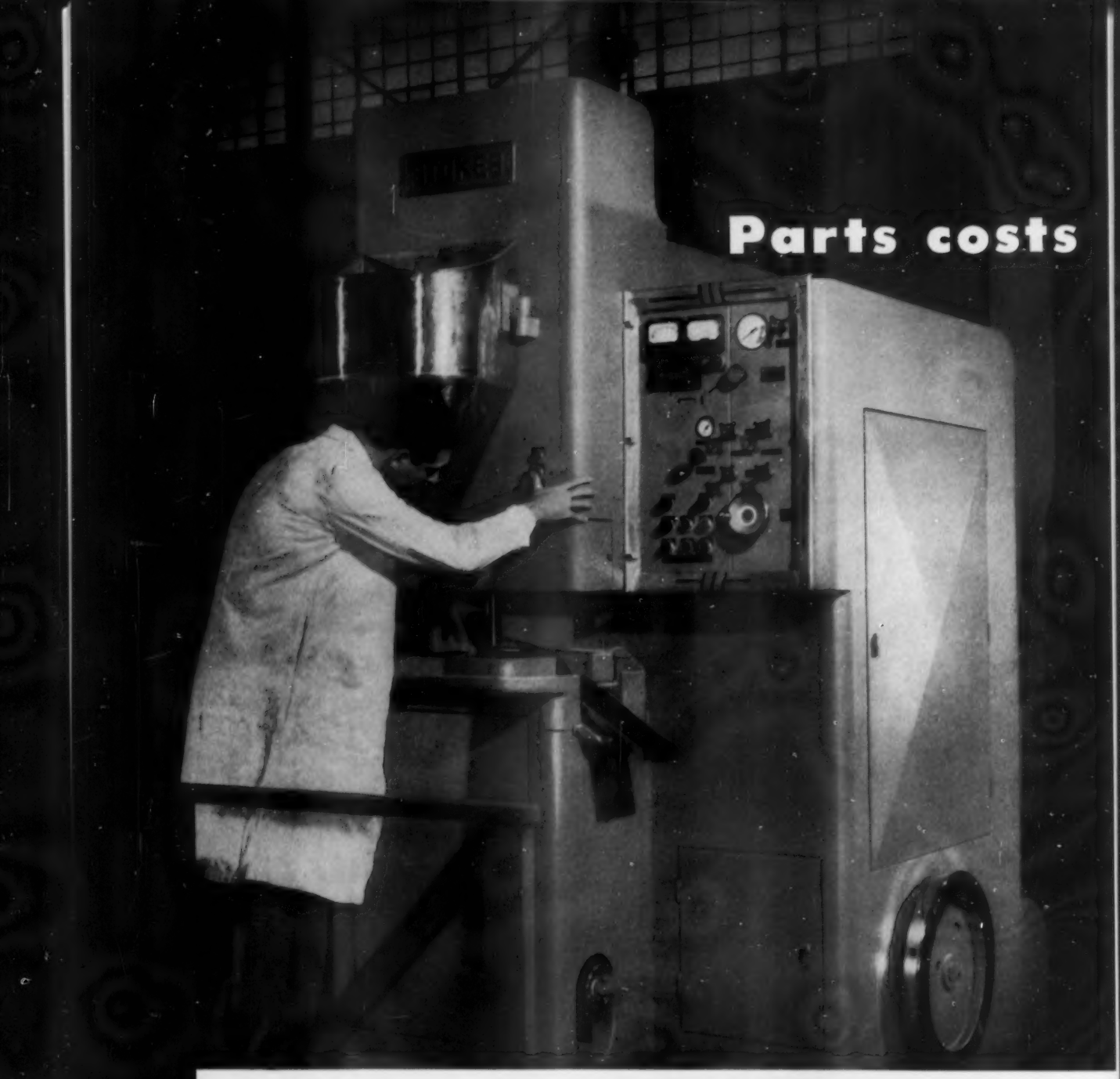
Address_____

City_____ Zone____ State_____

G-1688

For more information circle No. 47 on the Reader Service Card

Parts costs



Typical parts being produced on Stokes Model 640 Press by International Business Machines Corporation.

Feed pawl cost cut 64.6%
Sintered iron Tolerances:
thickness ±.002"
centerline to tip ±.002"
hole +.001", —.000"

Roll bearing cost cut 46.6%
Sintered bronze Tolerances:
O.D. +.000", —.001"
Bore: +.001", —.000"
Length: ±.001"

Ratchet cost cut 49.3%
Sintered brass Tolerances:
tooth form ±.002"
bore: +.002", —.000"

cut up to 65% at I.B.M.

—by compacting on STOKES powder metal press

On a Stokes 50-ton Model 640 press, International Business Machines Corporation produces a variety of powder metal parts at its Endicott, N.Y. plant. Close tolerances are maintained and costs are reduced up to 65%.

This is typical of the savings that powder metal processing can effect. On Stokes fully automatic compacting presses, many parts which are wasteful of metal stock, machine time and labor when made by conventional methods can be produced in high volume . . . at low cost. This technique applies to a wide range of metals, alloys and non-metallic powders . . . either pure or mixed. It often provides qualities unobtainable in the solid metal.

35 years experience in this field is the foundation for these outstanding features of the Model 640 press . . . latest addition to the extensive Stokes line of compacting equipment.

Easy setup and control . . . press adjustments operate independently, and are centralized at the front of the press. Handwheel calibrations are direct reading.

Precise tool alignment . . . protects tools, assures precision.

Clean operation . . . totally enclosed construction.

Full pressure breakaway at initial ejection eliminates possibility of pieces fracturing. All parts are fully supported during ejection; thin-flanged parts won't break.

Low maintenance, maximum safety . . . *plus great flexibility.*

Find out for yourself how Stokes powder metal pressing can cut parts costs. The Stokes service includes laboratory compacting of samples parts, accurate cost analysis, and design and production of punches and dies. Write today for the following literature: "Powder Metallurgy Today"; Catalog No. 801, "Stokes Powder Metal Presses"; Bulletin No. 670, "Stokes Model 640 Powder Metal Press."

Powder Metal Press Division

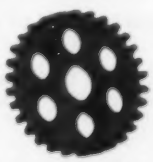
F. J. STOKES CORPORATION

5514 Tabor Road, Philadelphia 20, Pa.

STOKES

These leading custom producers profit from Stokes powder metal presses.

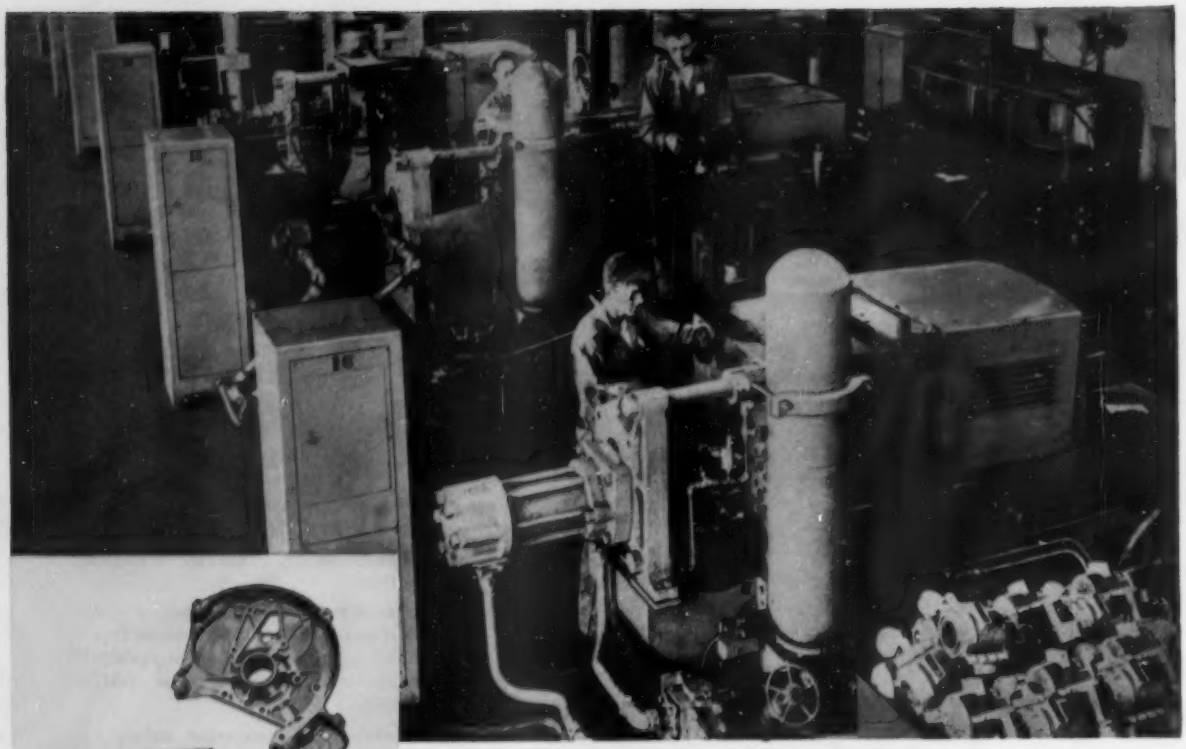
$25,000 yearly saved . . . $30,000 machine tool outlay avoided . . . by making lock parts on a Stokes press at Dixon Sintaloy, Inc., Stamford, Conn.



$20,000 per year cost-reduction was made on a wringer drive gear of iron and copper powder, for use on "Whirlpool" washers. Parts made by the Presmet Corporation, of Worcester, Mass. . . . on Stokes powder metal presses.

82% drop in cost is the story behind this drive gear for a home ice cream freezer . . . formed in a single operation on a Stokes press at Yale & Towne's metal products division, Franklin Park, Illinois.

For more information circle No. 50 on the Reader Service Card



These intricate magnesium die castings are typical of the 2,500,000 parts McCulloch produces each year in its plant above. The largest part shown is a chain saw body weighing 2½ lbs.

3-Shift Operation at McCulloch Motors Proves Reed-Prentice Die Casters Dependable, Efficient

To turn out approximately 1,250,000 lbs. of magnesium die castings annually, McCulloch Motors Corp. of Los Angeles has a 15-machine department. At the backbone of this operation, which averages a rejection rate of only 4%, are 10 Reed-Prentice "cold chamber" machines. These REEDS run three shifts a day, give McCulloch dependable, efficient performance.

Durability shows in their rugged construction, but only quality production like the record at McCulloch proves the precision engineering that goes into all Reed-Prentice machines. Exclusive full locking tonnage on every shot eliminates "pressure back-off", assures you a minimum of flash. Also available on both #1½G and #2G "cold chamber" die casters is the new "Hi-Speed, Hi-Pressure" plunger for use with aluminum and magnesium. This unit operates with precision control, increasing plunger speeds to 10,000 inches per minute to give you extra-dense, porosity-free castings.

You can get complete information and specifications on REEDS by writing to Reed-Prentice today.

REED-PRENTICE

Affiliate of PACKAGE MACHINERY COMPANY

WORCESTER 4, MASS.

BRANCH OFFICES: NEW YORK • CLEVELAND • CHICAGO • BUFFALO • DAYTON • DETROIT • KANSAS CITY • LOS ANGELES **REPRESENTATIVE:** MINNEAPOLIS—CHAS. W. STONE CO.

For more information circle No. 46 on the Reader Service Card

BETWEEN THE LINES

the editor's viewpoint on articles in current and forthcoming issues

FROZEN ALUMINUM? You may find that freezing your aluminum castings before machining will solve some of the difficulties you have had with dimensional changes due to internal stresses. A new technique developed by Canadian Westinghouse is reported, starting on page 51, in which castings are first heat treated and then frozen for four hours. Results: several operations have been eliminated, greater accuracy is possible, and costs are lower. Tomorrow, your heat treating department may have a deep freeze cabinet in it.

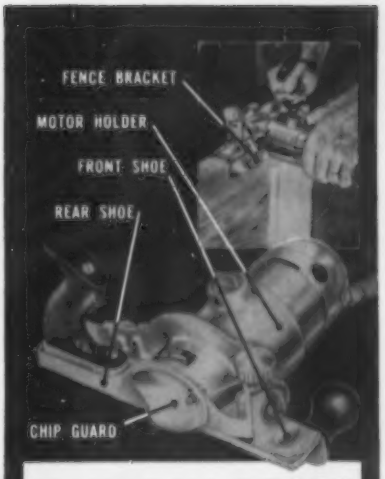
DIFFICULT INTERNAL PASSAGEWAYS, even those with small diameters, can be cored in investment casting using a new type of water soluble wax. Designers should find this development helpful in achieving smooth, continuous internal surfaces in their cast components. How this is done and what it can mean for the product designer are explained for the first time in this issue of PMM, starting on page 38.

HIGH PRESSURE HYDRAULIC GEAR PUMPS using gears made from iron powders have become practical due to new grinding techniques developed by a Cleveland firm. Not only do these gears perform as well as wrought gears at 1/3 the price, but they have better reproducibility from gear to gear than cut gears. They operate efficiently up to 3000 psi. Details of the gearing, and the grinding methods that have made it possible, will be a feature of the Finishing Section of next month's PMM.

HOW TO DESIGN FOR ALUMINUM BRONZE permanent mold castings will be another feature in August. Written by a leading British foundryman, it points out the influence of such factors as heat flow on mold life and suggests ways for the designer to get better results when he specifies this difficult-to-cast metal.

THE JOBBING PLATER who finishes die castings in his shop can make most effective use of a barrel finishing department to prepare the castings. A large electroplating plant in the East that is processing castings for companies in a 750-mile radius, has an 8-barrel tumbling department that keeps pace with a 100-man plating line. Read about their approach to barrel finishing in an article beginning on page 54.

WHAT YOU CAN GET WITH PERMANENT MOLD CASTING that is difficult to get in any other manner will be pointed out in an article coming up in PMM showing a typical design for a permanent mold. The great latitude inherent in the freedom of mold design will be analyzed, and the details of mold construction and operation will be outlined.



HAMPDEN BRASS

Die Castings have cleaner, smoother surfaces

Machining operations reduced to a minimum on STANLEY Power Plane

Hampden Brass's engineering department and the Stanley Electric Tool Division worked together to design the H33 Power Plane castings. These aluminum die-cast parts reduce machining time to a minimum. Each casting is of uniform thickness throughout, and all meet high quality standards in production quantities. Hampden Brass solved the problem of intricate coring and thin walls of the front and rear shoe, and the mating surfaces were used as cast . . . eliminating machining at the V-slide match. The result: quality die castings that fulfill every requirement at lower-per-unit cost.

Let HAMPDEN BRASS Help You Solve Your Casting Problems!

Avail yourself of our engineering counsel . . . or write for a casting quotation today!

Send for brochure, "Behind the Scenes" . . . complete digest of Hampden Brass's experience, equipment and facilities.

HB

HAMPDEN BRASS
AND ALUMINUM CO.
Established 1903
262 Liberty St.•Springfield, Mass.

Producers of Sand, Permanent Mold, Die & Fiberglas Castings

Circle No. 29 on Reader Service Card

Dodge Custom-made **Special Alloy Steel Goosenecks**

for longer service life

less maintenance

Here's the biggest news in die casting in years: a custom-made special alloy *steel* gooseneck that will outlast and outperform iron and alloy iron goosenecks currently available . . . and provide greater operational savings! Developed through years of experience and association with the die castings industry, Dodge Special Alloy *Steel* Goosenecks provide many advantages:

- Will outlast iron and alloy iron goosenecks by as much as 4-5 years.
- Maintenance problems are fewer because of long service life.
- Down time is reduced to a minimum because of long service life.
- Designed and made of special alloy steel, they prevent cracking . . . bottom breakout . . . spout erosion.

Each Dodge Special Alloy *Steel* Gooseneck is custom made to specifications by the Finished Products Division of Dodge Steel Company. Facilities are available for producing any size gooseneck for any die casting machine. Goosenecks are furnished either rough machined or machined with sleeves. Dodge provides a complete engineering service in the designing and production of steel goosenecks. Your inquiries are solicited, without obligation, of course. Ask too, about pots and other die casting machine parts including nozzles, spouts, plungers, etc.

DS

DODGE STEEL COMPANY

Finished Products Division

6501 Tacony Street • Philadelphia 35, Pa.

THE MOST IMPORTANT ALLOY IN A STEEL CASTING IS QUALITY

For more information circle No. 23 on the Reader Service Card

heat regulator body shown about twice actual size

a YALE powdered metal part... the millionth will be as accurate as the first

A large part, as powdered metal parts go. Difficult to produce in quantity to the accurate tolerances necessary. Helps run one of America's best-known automobiles.

The auto manufacturer chose YALE* to produce this part only after the most careful consideration of what we had to offer.

He knew that powdered metal parts cost far less than cast and machined parts, but that wasn't enough. It was vital that this savings in cost be accomplished with no sacrifice in quality. So he chose YALE parts.

He had to be sure the millionth part would be as accurate as the first. That we could give him delivery on schedule. Imaginative engineering. Large-scale production facilities. More reasons why he chose YALE. And then there was the most important fact, the one he'd known from the very beginning...

He knew he could depend on YALE. And he knows that you can, too. We're as close as your telephone whenever you'd like to talk about it.

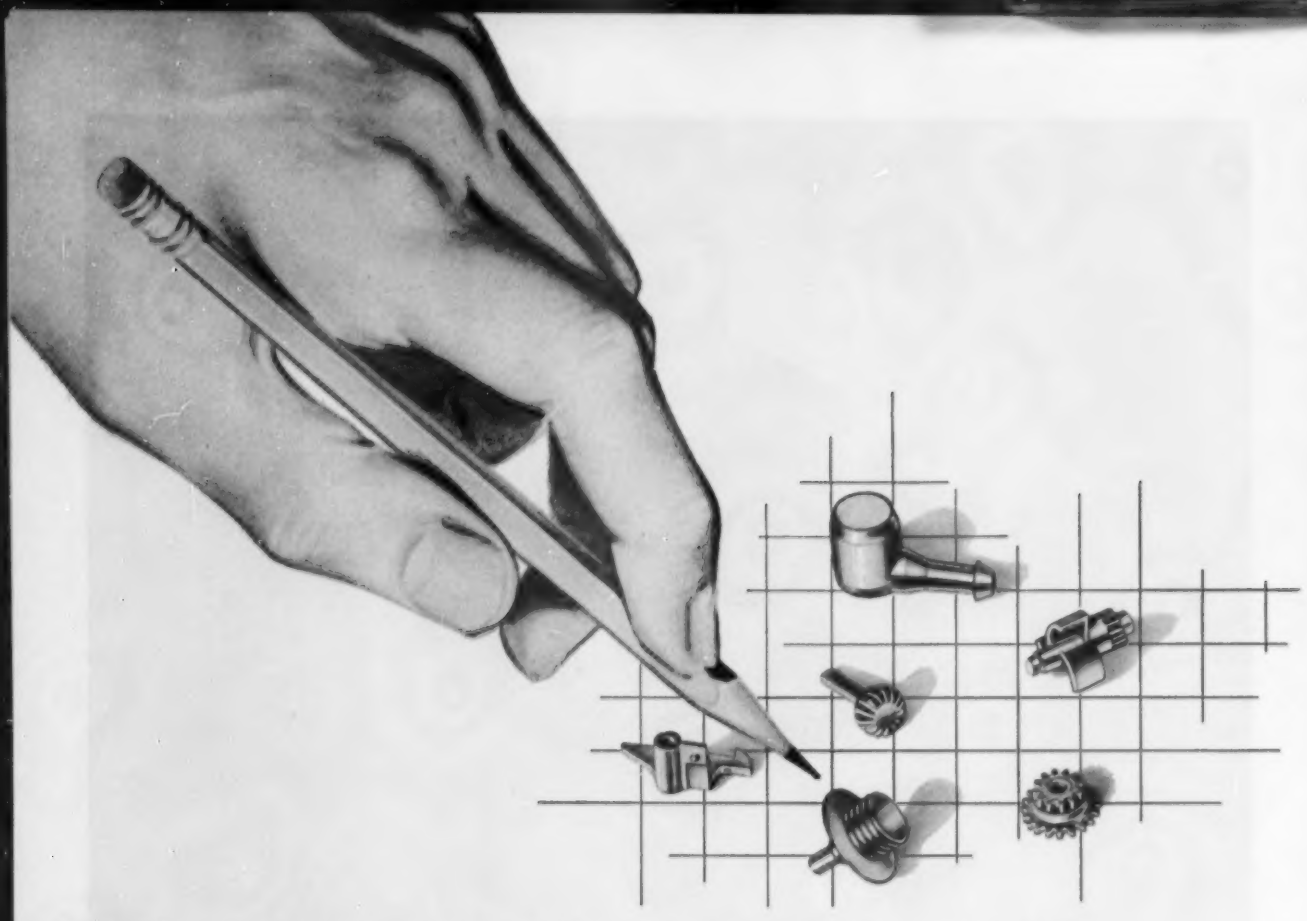
REG. U.S. PAT. OFFICE

powdered metal parts

YALE & TOWNE

THE YALE & TOWNE MANUFACTURING COMPANY, POWDERED METAL PRODUCTS DIVISION, 9335 BELMONT AVENUE, FRANKLIN PARK, ILLINOIS

For more information circle No. 57 on the Reader Service Card



GRC's small parts are doing a **big job** for industry:

helping product planners improve design while substantially reducing costs.

Yes, almost any industry you can name is benefiting from Gries' specialized small parts' manufacturing techniques. Exclusive GRC patented techniques and specialized machinery are giving design engineers wider latitude in their plans, enabling them to solve hitherto "impossible" parts problems, and to take advantage of many time- and money-saving short cuts. Broadly, GRC offers facilities for custom diecasting and plastic-molding of tiny parts; whichever the method, each part is engineered and manufactured to do its job better, because it is made better—at less cost.

GRC SPECIALIZED DIECASTING

Mass-produced in quantities from 100,000 to many millions, GRC's corrosion resistant zinc-alloy small parts are diecast in one automatic operation, completely trimmed and ready for use. Smallness and intricacy are unlimited — maximum length 1¾", weight up to ½ oz. Cost you less, because welding, scrap loss, expensive tools, machining, and assembly are eliminated or reduced—design is simplified. GRC has complete facilities for low-cost secondary machining and finishing.

GRC'S EXCLUSIVE INTERCAST PROCESS gives you completely *cast-assembled* small parts in single units or continuously interlocked assemblies. Maximum unit length 1½", maximum weight ½ oz.

GRC INJECTION PLASTIC MOLDING

Parts up to .03 oz. in weight and 1¼" long are economically molded of nylon or any other thermoplastic. Gries' unique molding technique minimizes shrinkage problems of nylon and makes the most of its important mechanical and electrical properties.

AUTOMATIC INSERT MOLDING. Gries has exclusive facilities for molding individual inserts and molding plastic elements on continuous inserts, such as wire, cord, etc.

GRC INDUSTRIAL FASTENERS

A complete line of zinc-alloy diecast wing nuts, cap nuts, thumb-nuts, wing screws, rivets; stocked for immediate delivery in any quantity. Rustproof, accurate, and durable, in plain bright and all commercial finishes.

GRC STANDARD PARTS

A large variety of zinc-alloy diecast standard and specialized components for open-stock orders. Includes such items as gears, pinions, rings, buckles, and thousands of components for all industry—all of the same quality and finishes as GRC fasteners.

WRITE, WIRE OR PHONE TODAY

for copies of BULLETINS describing GRC SERVICES and PRODUCTS:

- ☐ Small Parts Diecasting
- ☐ Small Parts Plastic Molding
- ☐ Industrial Fasteners
- ☐ Stock Sheet — Gear & Pinions
- ☐ Standard Products

GRIES

GRIES REPRODUCER CORP.

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For more information circle No. 72 on the Reader Service Card

PMM LETTERS

the readers' forum

DIE CAST HAND WHEEL SOURCE IS SOUGHT

Enclosed please find a die cast hand wheel for a valve. This hand wheel is being purchased at present from a valve manufacturer in quantities of 1000.

We believe that the hand wheels are being made by a die casting firm for several valve manufacturers and would appreciate your help in locating the prime source of supply.—E. L. T. (Buyer)

We do not recognize the producer, and no identifying mark is included on the casting. However, the hand wheel measures about 1¾" in diameter and has a square central hole. Any of our readers who produce this or a comparable wheel can get in touch with reader E. L. T. by dropping us a note.

We would also be glad to hear from any die casters who have stock dies for various knobs, dials, handles, pulleys and other such items. We get frequent requests for sources for these castings—Ed.

SHELL MOLD AND PERMANENT MOLD

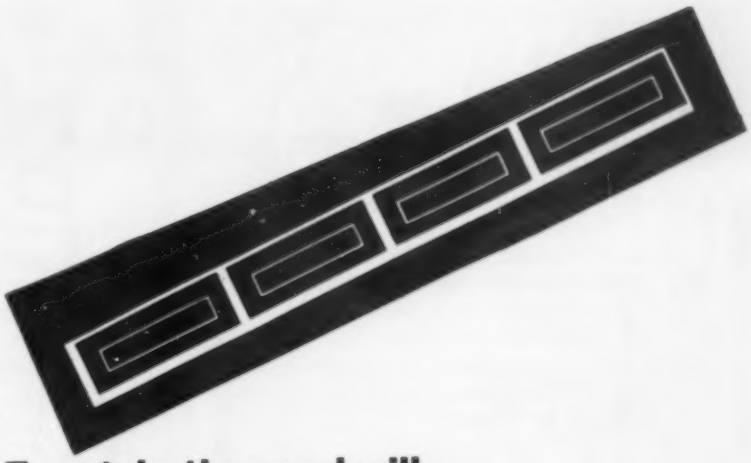
We are interested in obtaining information on shell molding and also permanent molds.

Would you be kind enough to relay any information you may have concerning this type of molding, and also manufacturers or fabricators who do this type of molding, or manufacturers of machinery which can be obtained to make shell moldings and also permanent molds?

We would appreciate this information at your earliest convenience. We became interested in this type of work from reading articles in your magazine. — P. M. W. (Design and Research)

We have carried many articles along these lines and have forwarded several. We have also asked the manufacturers of shell mold resins, most of whom have published comprehensive studies of the shell mold process, to forward their data. Relatively little has been published on permanent mold casting, outside of PMM.

Names of fabricators and also, equipment manufacturers, have been sent, so that this reader can investigate the processes.—Ed.



To retain the good will of the DIE-CASTING INDUSTRY, which forms an important segment of Federated's business, we adhere to these three basic policies:

1 We ship only the finest alloys we are able to produce. Only metals of highest purity are used and every furnace heat is checked spectrographically and chemically for composition, grain structure, fluidity and castability.

2 We offer personal service to the die-caster. Our trained sales and service engineers are available to discuss existing production problems or make recommendations without obligation to you. Hundreds of die-casters will tell you that this Federated extra is more than just lip service.

3 An important obligation of our research laboratories is a constant effort to improve die-casting alloys. Federated's family of zinc-base Di-Metals is a result of this sound metallurgical research.

We have informative literature available to help the die-caster. Or, if you prefer to discuss your problem with one of our sales or service engineers, just call your nearest Federated plant or office.

Federated Metals

DIVISION OF AMERICAN SMELTING AND REFINING COMPANY
120 BROADWAY, NEW YORK 5, N. Y.
In Canada: Federated Metals Canada, Ltd., Toronto and Montreal

Aluminum, Anodes, Babbitts, Brass, Bronze, Die Casting Metals, Lead, Lead Products, Magnesium, Solders, Type Metals, Zinc Dust

For more information circle No. 26 on the Reader Service Card

SAMMY INGOT

CHECKS THE SPECS FOR GOVERNMENT JOBS

BILL - THERE'S NO MARGIN FOR ERROR IN THIS GOVERNMENT JOB. HAVE YOU CHECKED EVERYTHING?
EVERYTHING BOB, THE MEN KNOW HOW TO CAST AND I'VE GOTTEN SAMUEL GREENFIELD CO. TO SUPPLY THE INGOT.
LABORATORY
THAT'S REALLY PLAYING IT SAFE BOB_FOR GREENFIELD INGOT IS YOUR BEST BET. WE HAVE ALL FEDERAL SPECIFIED ALLOYS. ALL ARE CHEMICALLY PURE AND TESTED IN THIS LAB.
BY CHECKING ALL MATERIALS SPECTOGRAPHICALLY ON THE NEWEST AND MOST EXACTING SCIENTIFIC DEVICES YOU ARE ASSURED THAT YOUR GREENFIELD INGOT WILL MEET THE MOST EXACTING FEDERAL SPECIFICATIONS
WELL - THERE GOES ANOTHER CONTRIBUTION OF OURS TO THE ARMED MIGHT OF OUR COUNTRY - AND SAMMY - YOU CAN TAKE A BOW FOR GIVING US FEDERAL SPECIFIED INGOT ON TIME, AND IN THE QUANTITY WE NEEDED.

"OUR INGOTS MAKE BETTER CASTINGS"

SAMUEL GREENFIELD ALUMINUM ALLOYS

- Chemically Pure
- Rigidly Supervised and Tested
- Certified Chemical Analysis Furnished

FREE FOUNDRY ENGINEERING CONSULTATION SERVICE

Over 120 years combined experience is yours at no obligation. Write or call . . .

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HUmboldt 4050

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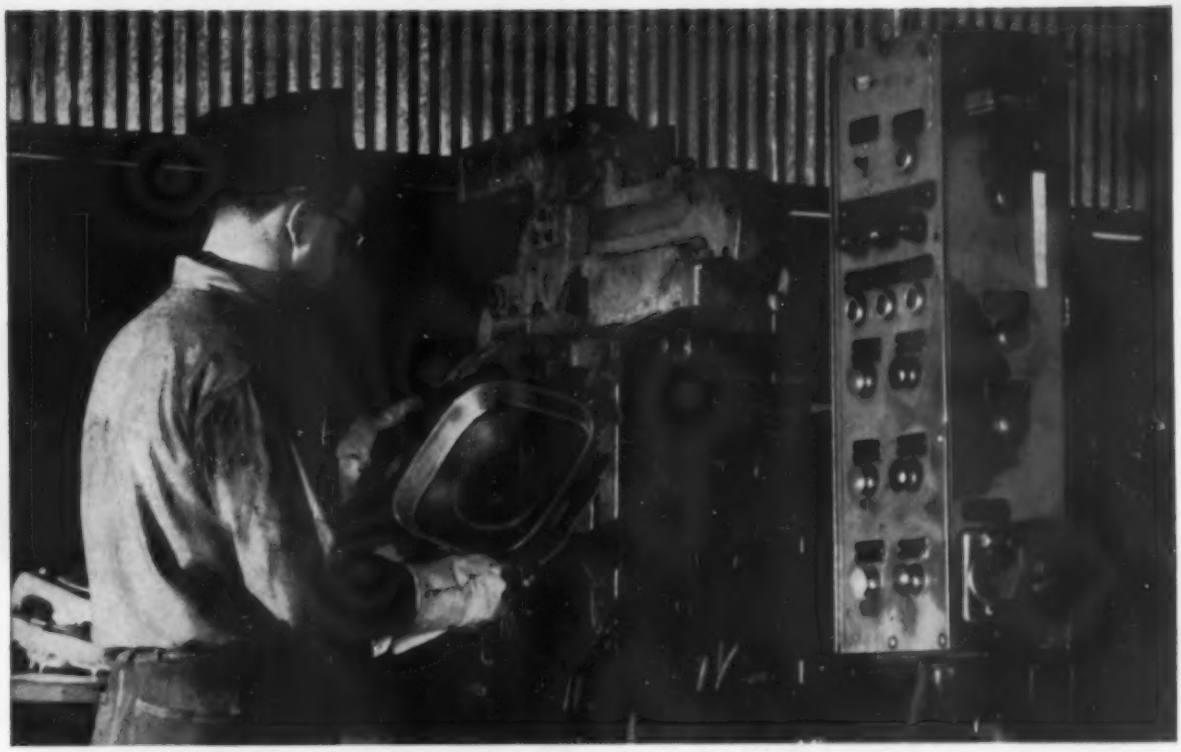


This aluminum frypan is die-cast by dies of Cr-Mo-V (High V) at Stowe, Pa., plant of Doehler-Jarvis Division, National Lead Co.

Save Money on Die Casting with CR-MO-V (High V)

Looking for savings in manufacturing costs? Want long production runs for die castings made of lead, aluminum or magnesium? Use Cr-Mo-V (High V)—Bethlehem's 5 pct chrome-moly tool steel, with 1 pct vanadium.

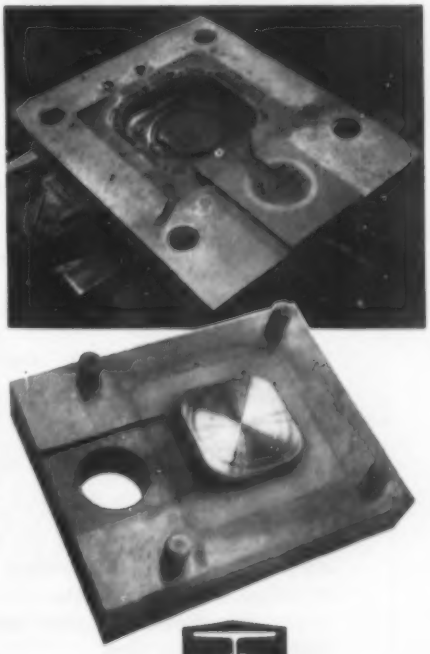
With Cr-Mo-V (High V), you get long, economical service where it counts—*before* the development of a fine network pattern of heat-checking. And when dies made of this fine tool steel are polished to a high lustre, they impart an exceptionally good surface to the casting.

Here's something else: Cleavage-cracking is no problem with Cr-Mo-V (High V), provided adequate radii are used in the die, and the steel is properly heat-treated. And because of its higher carbon content, plus high vanadium, this fine tool steel offers good resistance to surface-washing and erosion.

In making Cr-Mo-V (High V), we use proper melting procedure, plus adequate reduction of area in forging, thereby obtaining a steel with good grain refinement, uniform center density, and freedom from porosity and weak centers. Besides, this consistently high quality is always assured by means of ultrasonic testing.

For ease of machining, Cr-Mo-V (High V) is annealed to Brinell 217 max. It's steel that responds uniformly to heat-treatment, even in massive sections, because it has a uniform hardness of Rockwell C45-47.

Your Bethlehem tool steel distributor will be pleased to answer questions about Cr-Mo-V (High V). Or write to us at Bethlehem, Pa.



BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation
Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM TOOL STEELS

BETHLEHEM STEEL

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Latrobe's VDC

Die Casting Die Steel

shipped from stock

for this large die . . .

VDC *selected by*
Parker White-Metal Co.,
Erie, Pa.

Die *made by*
Kerner Tool and Die Co.,
Erie, Pa.

VDC aluminum die casting die for casting transformer covers. Die was made from 8" x 24" and 6" x 24" bar stock carried in stock by Latrobe.

Here's why leading die casters select VDC...

- V D C has sound structure and freedom from porosity.
- V D C has excellent resistance to wash and heat checking.
- V D C possesses excellent non-deforming characteristics.
- V D C is stocked in a wide range of sizes for immediate shipment.
- V D C has excellent impact strength, machines easily, and can be water cooled in servic

Latrobe's VDC hot work die steel is an air-hardening, 5% chromium die steel with high vanadium content — especially suited for aluminum, zinc, and magnesium die casting dies.

Call your Latrobe representative . . . specify VDC for your next die casting die.

For more information circle No. 34 on the Reader Service Card

LATROBE
STEEL COMPANY
Main Office and Plant: Latrobe, Pa.
Branch Offices and Warehouses in Principal Cities

PMM PEOPLE

changes & appointments

Paul D. Wright, formerly associated with fuel element development engineering at *General Electric's* Hanford Atomic Products Operation, was recently appointed research engineer in the advanced development section of the company's Carboloy Department in Detroit.

Frank R. Caldwell, an experimental physicist who played an important part in developing the country's first ramjet, has been named to head the Combustion Controls Section of the Mechanics Division of the *National Bureau of Standards.*

Fischer & Porter has announced three promotions in its sales department: **Philip E. Sellers,** formerly sales manager, becomes sales vice-president; **Herman Kockritz,** formerly southeastern divisional manager becomes field sales manager; and **William Trethaway,** formerly sales engineer becomes district manager of the Atlanta office.

Dr. Irving Roberts, who has been associated with *Reynolds Metals Company* as a consulting engineer during the past five years, has been appointed director of planning for the company. He will have his headquarters in Richmond.

Crucible Steel Company of America has appointed **Robert M. Simpson** manager of the company's Los Angeles sales branch. Prior to this new assignment, Mr. Simpson was manager of Crucible's San Francisco sales branch.

The appointment of **John B. Henry, Jr.,** as product manager of high temperature metals and valve steels and **George C. Kiefer** as manager of application development has been announced by *Allegheny Ludlum Steel Corp.*

Dr. Paul Schwarzkopf, president of the *Schwarzkopf Development Corp.* and of the *American Electro Metal Corp.* is now on tour of Japan, at the invitation of the Nippon Electric Company Ltd., Tokyo, and will lecture on the developments of powder metallurgy since the end of World War II.

Maxwell Bornson has been appointed assistant manager of the Publications Department at *Ford Instrument Company, Division of Sperry Rand Corp.*

Clifford G. Carten has been appointed regional engineer for the Southern Connecticut area by the *Exbec Barrel Finishing Corp.*

Continued next page

It's the **BALANCED *Synclinal* DESIGN**

that makes
MARVEL
Synclinal
FILTERS
American
Industry's
A-1 CHOICE

SUMP TYPE (cutaway)

LINE TYPE (cutaway)

In the plants of America's industrial giants, as well as in smaller plants, Marvel Synclinal Filters are being installed on all types of hydraulic and other low pressure liquid circulating equipment. Marvels are chosen because of their excellent performance in protecting machines and increasing production by reducing down-time. They are proving again and again, their superiority in the one real test—ON THE JOB! The BALANCED Synclinal Design of Marvel Filters provides that all-important balance between maximum ACTIVE filtering area and sufficient storage space for filtered out particles—therefore, longer periods of productive operation are attained at the absolute minimum of maintenance. They meet J.I.C. Standards.

Not only plant operators, but also, OVER 650 ORIGINAL EQUIPMENT MANUFACTURERS have recognized the superiority of Marvel Synclinal Filters and now install them as standard equipment.

Specify MARVEL SYNCLINAL FILTERS on New Equipment—Standardize with Marvel's on Existing Equipment

EASY MAINTENANCE

Both sump and line types may be easily disassembled, cleaned and reassembled by any workman, on the spot, in a matter of minutes. Line type operates in any position and may be serviced without disturbing pipe connections.

WATER FILTERS

Both sump and line type filters have been adapted for use in all water filtering applications. No changes have been made in the basic, balanced synclinal design.

A SIZE FOR EVERY NEED

Available for sump or line installation in capacities from 5 to 100 G.P.M. Greater capacities may be attained by multiple installation (as described in catalog). Choice of monel mesh sizes range from coarse 30 to fine 200.

FILTERS FOR FIRE-RESISTANT HYDRAULIC FLUIDS

Marvel's most recent development is a filter for the efficient filtration of all types of fire-resistant hydraulic fluids.

IMMEDIATE DELIVERY!

As in the past, Marvel continues to offer IMMEDIATE DELIVERY.

Catalogs containing complete data available on request

MARVEL ENGINEERING COMPANY

7227 N. Hamlin Ave., Chicago 45, Ill. Phone JUniper 8-6023

Without obligation, please send me complete data on Marvel Synclinal Filters, as indicated:—

☐ Catalog No. 107—For Hydraulic Oils, Coolants and Lubricants

☐ Catalog No. 301—For WATER

Data on Filters for Fire-resistant fluids —

☐ AQUEOUS ☐ SYNTHETIC

Name .....

Company .....

Address .....

City .....

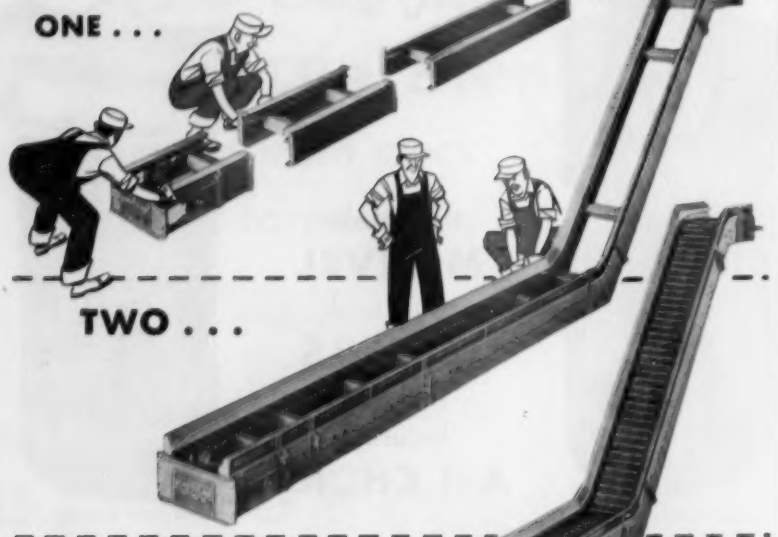
State .....

PMM-7

For more information circle No. 84 on the Reader Service Card

WE ASSEMBLED OUR OWN CUSTOMIZED CONVEYOR AS EASILY AS...

ONE . . .



TWO . . .

THREE . . .

WITH MAY-FRAN

STANDARD COMPONENTS

Through standardization, MAY-FRAN now makes it possible to assemble mass produced components into virtually any type of conveyor to handle a wide range of products or materials.

This program is cutting costs for manufacturers because . . . it means they can dis-assemble their conveyors for use in other plant locations . . . it means conveyors can be modified in almost any way at minimum cost.

Pre-fabricated sections are available rapidly and inexpensively. Straight sections . . . concave or convex sections . . . take-up charge and discharge-end sections can be furnished to meet specific requirements of belt width as well as load bearing and volume capacities.

Write today for complete information

MAY-FRAN ENGINEERING, INC.

1686 Clarkstone Road • Cleveland 12, Ohio

For more information circle No. 40 on the Reader Service Card

PEOPLE

continued from page 31

Vickers Inc. announced two new appointments: **Thomas B. Doe, Jr.** as manager of export sales and **Russell Dupuis** as plant manager of the Omaha Production Division.

Alcaloy, Inc. has announced the appointment of **R. A. Entringer** as general manager. Mr. Entringer was formerly general sales manager for the company.

Russell R. Noble, chief engineer of trucks, Central Engineering Division, *Chrysler Corporation,* has been awarded the Engineering Society of Detroit's annual award of An Outstanding Young Engineer for 1956. The award was created in 1953 by the Junior Section of the Engineering Society of Detroit to publicly recognize the high caliber of young men comprising today's engineering profession.

John B. Hinds has recently been named as specialist-planning and methods for *General Electric Company's* Elmira Foundry.

The Wellman Bronze & Aluminum Company announced the addition to their staff of **Clayton A. O'Neill** as manager of the Permanent Mold Division.

U. S. Reduction Company has announced the election of two new vice-presidents: **R. W. Tompkins,** vice-president in charge of sales, and **H. A. Estabrook,** vice-president in charge of production.

Elgin National Watch Company has announced the appointment of **Douglas Graham** as product manager of the company's abrasives division.

Sylvania Electric Products, Inc. has announced the election of **Dr. Bennett S. Ellefson** as vice-president in charge of engineering and research and **Marion E. Pettegrew** as vice-president in charge of the tungsten-chemical and parts operations.

Jack A. Yoblin was recently appointed carbide products development engineer for the Carboloy Department of *General Electric Company.*

Shallway Corp. has announced the appointment of **Charles Lay** as Shalco shell molding equipment service manager.

The appointment of **Robert G. Keller** as chief engineer has been announced by *The Lewis Welding & Engineering Corp.* Mr. Keller will be assisted by **Johan Muller,** chief development engineer of the Machine Division.

now...

LINDBERG-

FISHER

Electric

RESISTANCE

FURNACE WITH...

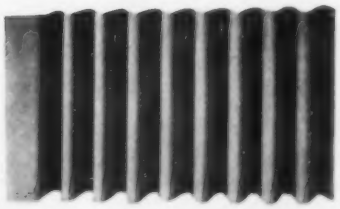
CORRTHERM

HEATING ELEMENT

For permanent mold, sand casting, and die casting of aluminum, magnesium, zinc and lead, Lindberg-Fisher now offers its improved Electric Resistance Furnace with the revolutionary new CORRTHERM Heating Element.

Lindberg-Fisher ER Furnaces have, time and again, meant lower cost per lb. of finished casting. And with practically indestructible CORRTHERM elements, lower furnace maintenance costs and longer crucible or pot service assure you of even greater savings.

These furnaces eliminate localized heating of metal, and gas absorption, because no products of combustion are present. No exhaust fumes or smoke means less operator fatigue and higher production. Investigate the advantages of this furnace. Write for Bulletin No. 321.



CORRTHERM elements are large sheets of nickel chromium. They are easy to install, just hang in furnace, and operate at extremely low voltages, completely eliminating shock or short hazards.

LINDBERG FISHER **MELTING FURNACES**

A Division of Lindberg Engineering Company

2463 WEST HUBBARD STREET, CHICAGO 12, ILLINOIS

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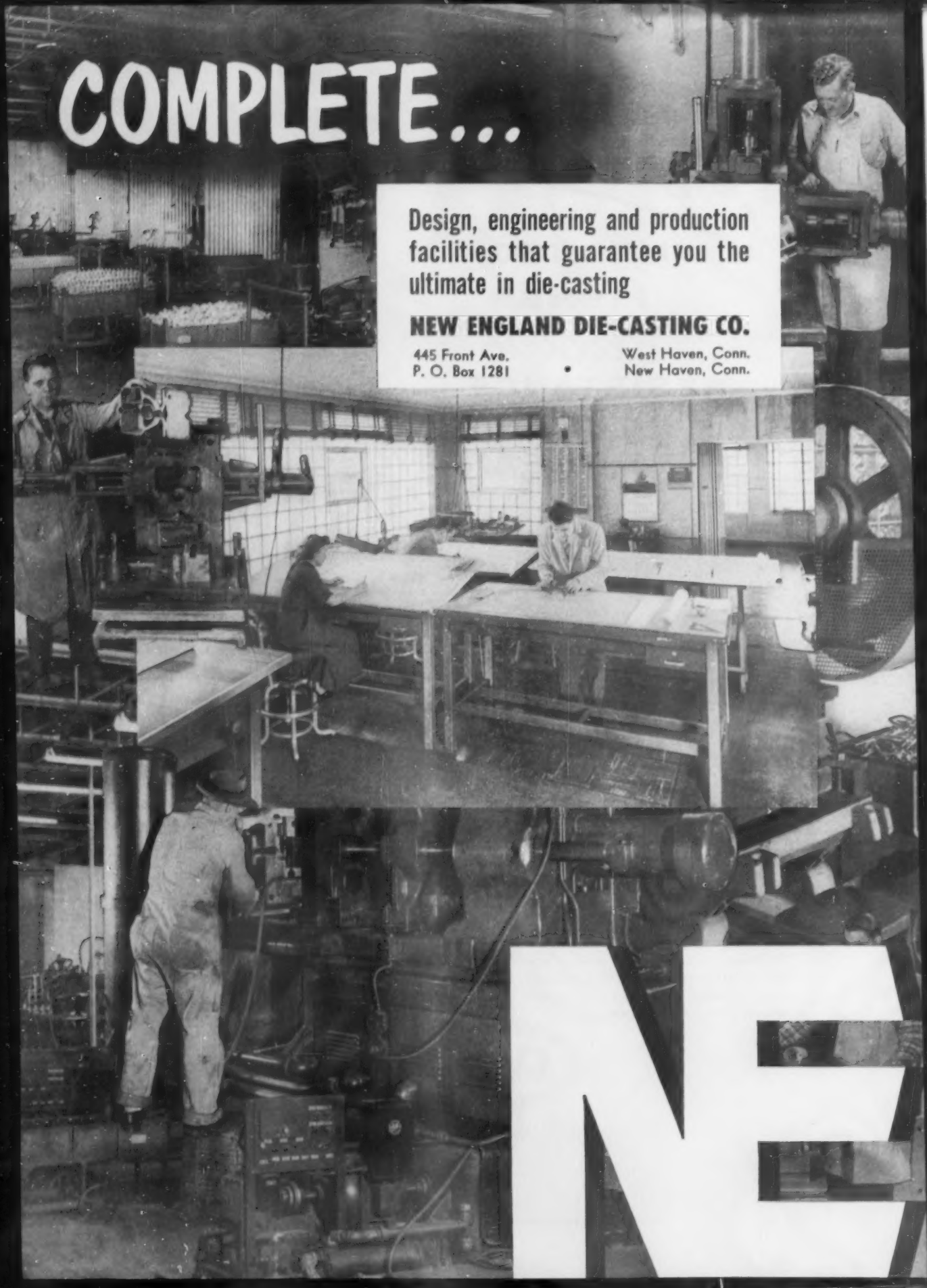
COMPLETE...
Design, engineering and production facilities that guarantee you the ultimate in die-casting
NEW ENGLAND DIE-CASTING CO.
445 Front Ave.
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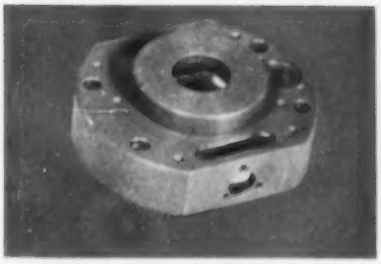
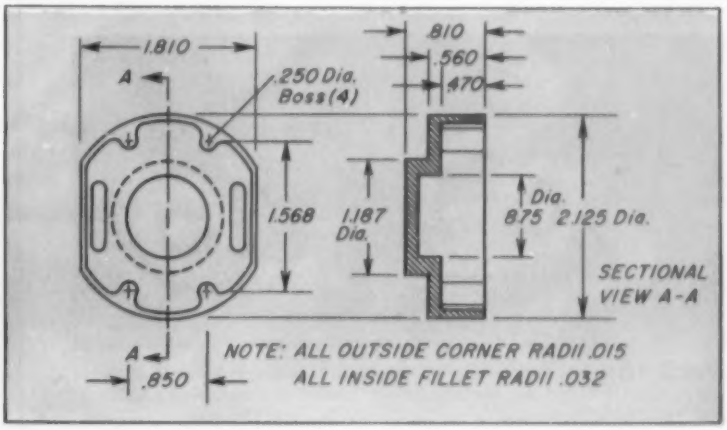
NE

Four processes were compared to get . . .

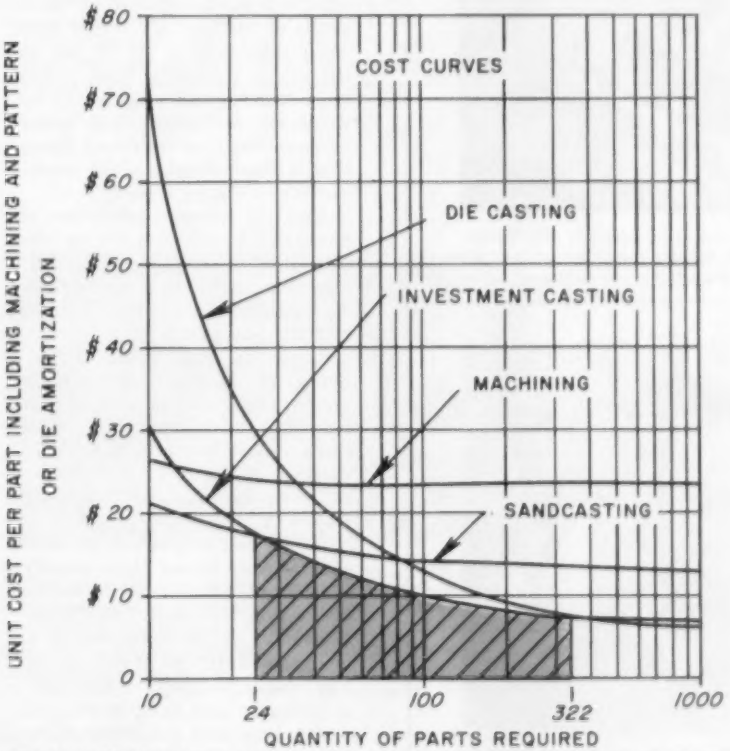
One Hundred Precision Housings At Low Cost

The Problem





A WEST Coast manufacturer of precision instruments recently was faced with the need for producing 100 instruments that would duplicate their preliminary, hand-made models. The housings for these had been machined from aluminum bar stock and were not only too expensive, but required too much manufacturing time.



AREA IN COLOR shows range most economical for investment casting. These curves apply *only* to the specific conditions of this piece, will vary widely for other pieces depending upon shapes, alloys, tolerances and other conditions.

The company then investigated three possible alternative methods of making the housings to compare costs and delivery times. In each instance, the tooling costs were written off over the first 100 castings, since there could be no assurance of repeat orders.

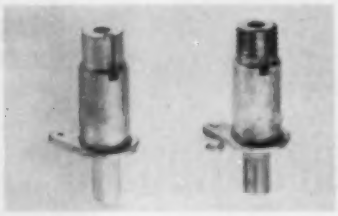
To adapt this design for casting, certain detail changes were made. Sharply changing wall sections and irregular contours were smoothed out, and a careful study of the mating parts was made.

The three processes considered for these housings were sand casting, die casting and investment casting. Although the originals had been machined without the benefit of special tooling or holding fixtures, these costs were compared, too, adding the expense of minor tooling to the computation.

The Solution

Machined from bar stock: Using the original configuration, firm estimate on producing the part from bar stock with minor tooling required, established the cost as $26.50 each in lots of ten, and $23.50 each in lots of 100. No price break was given for quantities between 100 and 1000. Delivery time of three weeks was required for delivery of 100 pieces.

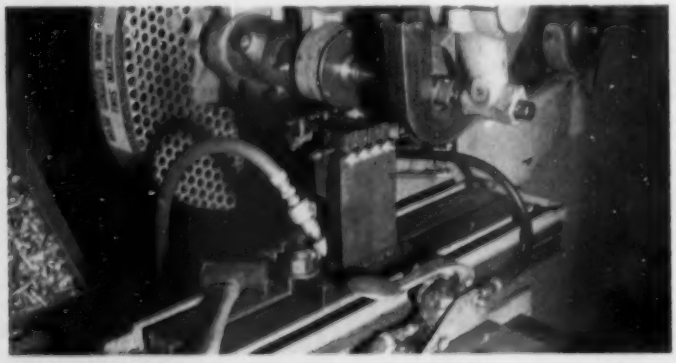
Continued on page 78



HEART of the range timer is this cooktime shaft, shown at left, as received from the die caster and at right as fully machined. Three simple operations are required.

G-E Buys Tiny

OPERATION 1 is the cutting of threads in this bench lathe. The turret head is hand fed and the workpieces are loaded and unloaded manually. Good machinability of the zinc alloy produces clean threads.



OPERATION 2 is the milling of a narrow slot beneath the flange. The slot could be cored, but would increase tooling costs, complicate die maintenance. Gang slotting has been introduced. An air-actuated table traverse and air-operated fixture to hold four castings make this fast.

OPERATION 3 is staking a small stud into a hole cored in the flange. This assures closer center location than could be achieved by casting the stud integrally. Operation, using a Denison press, is fast and positive.

RECENTLY, the Appliance Control Department of General Electric Company shipped the 6,500,000th appliance timer since its plant was established four years ago at Morrison, Ill.

Early in its manufacturing experience, the Department found that zinc die castings work equally as well as . . . and often cost substantially less than . . . assembled stampings and screw machine parts when used for small gears, cams, pinions and other time control elements.

In a number of instances, preferred design details have been made possible by the conversion to die castings. For example, the shank on the cooktime shaft, shown being machined in three views at the left, is die cast with eight sides held to .217 ± .001 on the major diameter. This, it has been found, gives a tighter fit for the shank, and wears much better in operation, than the round shank that is characteristic of the previous screw machine part.

Also, the inherent advantage of one-piece construction as obtained by die casting has contributed improvements in concentricity, rigidity and relative location of critical surfaces.

Now, dozens of small components weighing a fraction of an ounce apiece are die cast in zinc for G-E by Gries Reproducer Corp. of New Rochelle, N.Y. These castings perform vital functions in the operation of the G-E range timers.

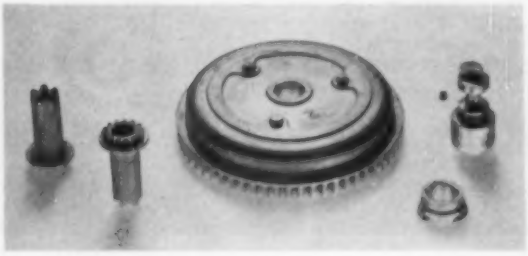
Tolerances, in general, are held considerably closer than usually considered "commercial limits" for die casting. Relatively few dimensions have had to be opened up to meet the limitations of die casting. The cooktime shaft is the heart of the timer and must meet strict dimensional and performance requirements. Its dimension from

Continued on page 78

Precision Parts By The Million

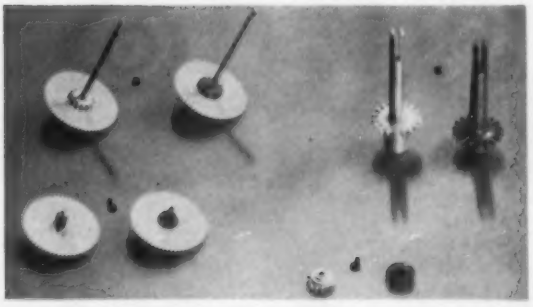
COVER STORY

THESE DIE CASTINGS WEIGH HALF OUNCE OR LESS

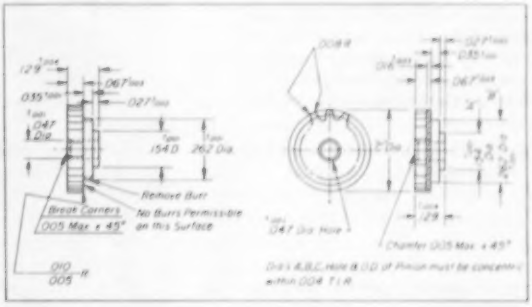


SPECIAL SHAPES are often most economical as die castings. Of particular interest in this respect is the upper cam shaft (a) which was formerly machined from aluminum or steel bar. Not only were many machining operations required, but great difficulty was encountered in milling the flat face of the eccentric at the top of the shaft. The outer edges of this flat must have virtually no radius, because this would affect the setting of the timer. Sharp corners were very difficult to obtain by milling the flat; they are much sharper and cleaner as die cast.

BURRS ARE NO PROBLEM on the die cast pinions and gears shown above. In addition, the die caster has been able to incorporate extra features such as flanges, shafts, hex heads, etc. Cost of a combination gear is not much greater than that of a simple gear, yet saves a great deal as compared with assembled stampings. The small pivot (a) is a simple piece to produce by automatic screw machine, yet the die casting costs less and gives equal performance. Where protective coating is required, a simple dip type conversion coating is specified.



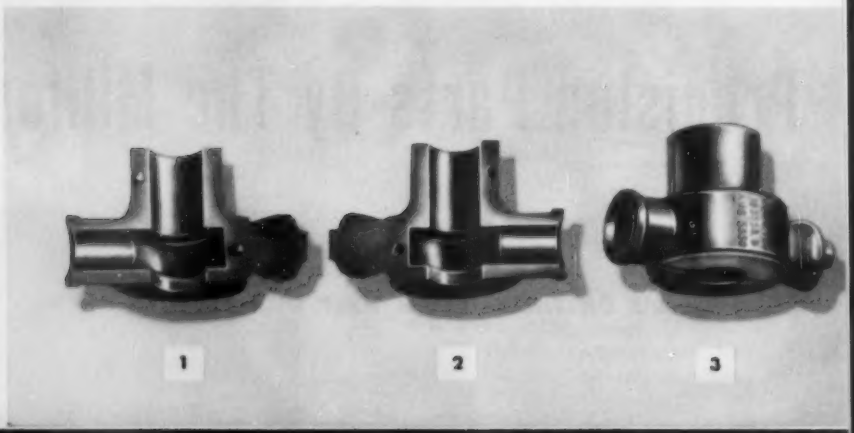
OLD AND NEW gear designs are compared in this photo which shows four different gears. In each pair, the one on the right is the die casting. In (a) and (b) a flat spring, stamped gear and screw machine shaft are assembled by staking the pinion in place. The die cast pinion gives more bearing surface and better anchorage to withstand stresses. The slotted shaft with gear (c) was formerly made by staking a stamped aluminum gear to the shaft. It is now die cast in one piece. Note the tapered shaft and large radius that have been introduced. Many small pinions, as at (d) have been redesigned as die castings.



COMPARISON OF TOLERANCES between the previous type of brass pinion (left) produced from pinion stock, and the die cast one (right) shows no opening up of tolerances. Also, note that the instructions, "No burrs permissible on this surface," are unnecessary on the die casting drawing. Hole diameters and OD are held within very close concentricity in the die cast pinion. Note that the tolerances called for on the die casting drawing are closer than are considered "average commercial" limits, ranging as close on selected dimensions as ± .001. The die cast pinion has a .016 shoulder to simplify trimming.

CONVENTIONAL PATTERN . . .

. . . is this two-piece wax assembly. Wax weld forms heavy parting line inside and out. At 2 can be seen reentrant parting line before wax welding. Match effect of this unfilled joint would seriously reduce casting's fatigue strength. Wax welding is mandatory for this aircraft part.



Special brass elbow for electronic use has uniform, continuous internal diameter of .228. Walls of elbow are also uniform without objectionable seams or parting lines.

Vacuum body in SAE 8620 steel, used in the lamp manufacturing industry, has internal passageways cast to required tolerances without objectionable parting lines.

Special burner nozzle, orginally designed to be welded of several pieces and remachined, is cast using soluble core. Nozzle has hidden, trapezoidal irregular ports with critical radii on all edges. In production of the unit, no way was found to machine these radii and ports after assembly. Soluble cores overcame this difficulty.

Soluble Cores

offer an economical way around multiple-unit patterns for complex castings

By W. A. DUBOVICK
Engineered Precision Casting Co.

THE remarkable growth and increasing acceptance of investment castings throughout the entire metalworking industry has been due, in large measure, to the freedom of design which the process permits. As designers became more familiar with the possibilities offered by the investment casting process, the parts became more and more complex. Die-making ingenuity of the investment casting producers has usually been able to meet these requirements; however, in certain cases requiring complicated and devious internal passageways, the problem of producing satisfactory castings could not be solved by making a single die to produce the part.

The investment casting producer, using wax or plastic for his disposable patterns, was then forced either to produce his wax patterns in two or more pieces which were assembled into a unit pattern by some method or to employ some type of ceramic or soluble core which could be placed within the die prior to injecting wax for molding the exterior.

Ceramics, because of the problem involved in their manufacture, the cost of tools, and other undesirable characteristics which developed foundry problems, could only be used for the simplest of shapes. The idea of using soluble cores appeared as the simplest solution to this problem, but the lack of a satisfactory material for this purpose prevented wider use of this method.

Soluble wax. Among the first soluble pattern materials considered were various kinds of salts which could be melted or dissolved and poured into molds to form the shapes required in the casting. Difficulty in handling these materials and inconsistent results which they produced forced their abandonment.

The development of a wax which is soluble in water and which can be molded in wax injection machines brought about a revival of interest in soluble cores. Tantalite, Inc., in collaboration with its associate, Engineered Precision Casting Company, has been able to develop a method of

Continued next page

"Where smooth, devious internal passageways are a functional requirement, soluble cores offer greater design latitude . . ."

handling water soluble wax on a commercial basis for producing parts with intricate passageways which would have been practically impossible to produce otherwise. This has opened up a field of design which was previously considered only possible for realization through the use of the frozen mercury process.

How it's done. To use the soluble cores successfully, a wax injection die must be constructed to form the outside walls of the part. Core prints are provided in this die similar to those used in sand foundry work. Another wax injection die is then constructed for making the soluble cores. This die is comparable to the conventional core box used in the sand foundry. Soluble cores are made on a special wax injection machine. The core is then placed in the regular wax injection die and the wax is injected around it.

The wax pattern, with its soluble core, is next placed in a water bath which dissolves the wax core leaving the wax pattern with an internal configuration exactly like that of the soluble core. The wax patterns are finally mounted and gated in the standard manner. The process from this point is exactly the same as used for regular production work.

Because of the low strength and low melting point of the soluble wax, it cannot be used in conjunction with plastic patterns.

Where they can be used. Soluble cores permit the wax patterns to be produced as single monolithic parts. The use of soluble cores can be applied to the production of any part *where smooth devious internal passageways are a functional requirement.* In the electronic field, this technique will permit greater design freedom in the formation of radar wave-guides and plumbing components. In the electronic tube and incandescent lamp manufacturing industry, it can be used to produce various types of vacuum bodies and nozzles required in the equipment and machines used to manufacture these items.

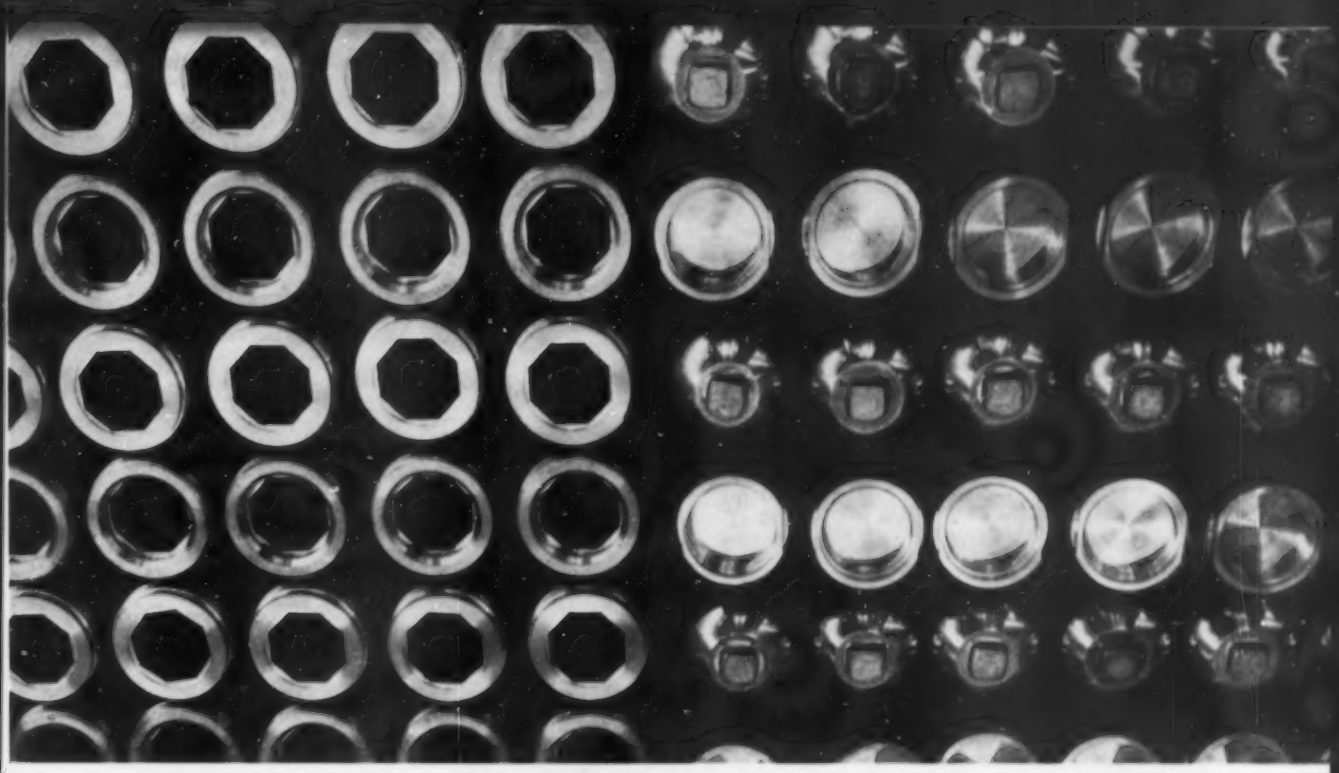
In the aircraft industry, the method offers greater latitude for design of special elbows, manifold inlets and outlets, various types of nozzles, and pump bodies. Applications requiring venturi effects or designs requiring changes in internal diameter or intersecting passageways, which would require difficult boring and perhaps plugging operations, can be designed for production as investment castings using soluble cores to form the interior shape.

A study of the illustrations will give an idea of the type of parts which could be handled satisfactorily using soluble cores. When parts are to be produced within the dimensional limits of the investment process, this method offers a satisfactory solution to many difficult design and production problems.

NINE BENEFITS THAT COME FROM USING ONE-PIECE WAX PATTERNS

THE main advantage of using a soluble wax core instead of assembling the pattern from several pieces lies in the fact that the final pattern is produced as a single part and that joints are thereby eliminated. The following benefits are derived by using soluble cores:

1. There is no dimensional inaccuracy due to varying thicknesses of adhesive when joining wax or plastic sections to form the pattern.
2. Removal of excess metal at welded joints in the wax patterns is eliminated.
3. Mismatches and steps are non-existent.
4. Wall thicknesses are held more accurately since there is no grinding out of mismatches.
5. There is no loss of tolerance due to imperfect fitting of pattern sections.
6. The human variable is eliminated since there is no manual assembling of pattern sections.
7. Notch or stress-raiser effect of re-entrant parting line is eliminated. This occurs when joints are not filled after pattern sections are mated, regardless of the pattern material which may be used.
8. There are no rejections caused by imperfectly welded pattern joints. Unless these joints are completely filled, investment material will be forced into them and form a fragile fin or projection which may crumble upon contact with molten metal. These particles may be trapped within the interior of the casting with possible loss of strength at those sections or may lodge at the surface and produce an unsightly, if not objectionable, appearance.
9. Tooling charges are lower as it is usually much easier to construct a mold or die to produce the soluble cores than to make dies for the various sections. The fixture which is usually required to hold the sections in position during the assembly is also eliminated.



VALVE TRIM in sizes from ½ to 2 inches with minimum density of 4.51 g/cc as produced by Clevite Research Center.

Lower scrap loss and saving in metal used are reasons why powder metallurgy is sometimes the least costly way to fabricate titanium. Here is a report of current experience in producing parts weighing up to six pounds by . . .

Titanium Powder Metallurgy (Part three)

by R. F. BUNSHAH*, H. MARGOLIN**, and I.B. CADOFF***

AFTER an initial period of development in the forties, interest in titanium powder metallurgy has again increased in the last two years. Several titanium powder metallurgical parts are on the market on a commercial basis having weights up to six pounds. Clevite Research Center has made such parts as bearing housings, valve trim (shown above) and rivets by powder metallurgy. They also make "ingots" up to 125 lb in weight.

The Utica Drop Forge Corp. has reported a new process whereby intricate parts having undercuts and screw threads can be made in a single press and sinter operation. These parts have maximum density and require little or no finish grinding.

Typical examples of titanium powder metallurgical parts are shown.

Titanium powder metallurgy parts are primarily made of unalloyed titanium. Dean, Wortman, Long and Anderson in 1946 produced unalloyed titanium of maximum density having a tensile strength of 82,000 psi and 28% elongation in two inches. This is quite comparable to the properties of present day arc-melted commercially pure titanium.

The base material was prepared by grinding sponge, and properties controlled by proper proportioning of powder sizes. H. W. Dodds of Brush Laboratories in 1955, also using sponge titanium, obtained powder metallurgy parts of maximum density having lower strength and higher ductility than Dean and his workers. This indicates a higher order of purity of titanium than was revealed in the earlier work of Dean et al. Chemical analysis and mechanical properties of Brush Laboratories' hot pressed and press formed material, Ti-Brush 40, are indicated in Table I.

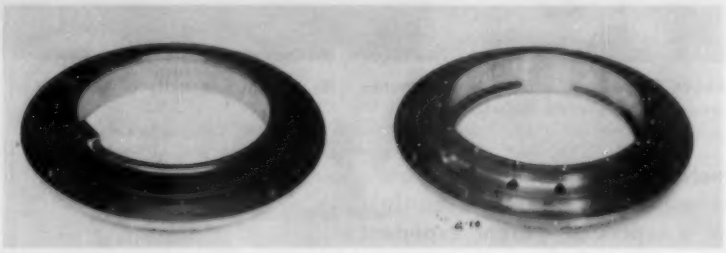
Other properties of Ti-Brush 40, are also comparable to those of commercially pure metal. The

*Associate Engineering Scientist, New York University; **Head, Physical and Structural Metallurgy Section, Metallurgy Laboratory, N.Y.U.; ***Assistant Professor, and Head of Solid Technology Group, N.Y.U.

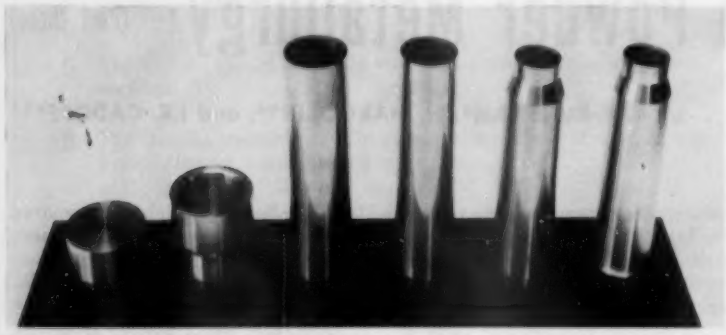
TABLE I: Analysis and properties of hot pressed and press formed Ti-Brush 40

Chemical Analysis	Hot Pressed	Press Formed
Carbon	0.014%	0.01%
Oxygen	0.093%	0.10%
Nitrogen	0.013%	0.011%
Hydrogen	0.0019%	0.0004%
Iron	0.095%	0.090%
Tensile Properties		
0.2% Yield Strength	39,900 psi	39,300 psi
Tensile Strength	58,400 psi	61,200 psi
Elongation in 0.850"	35.0%	42.6%
Reduction In Area	53.3%	60.5%

AND SOME CURRENT APPLICATIONS OF TITANIUM



BEARING SUPPORT for a jet aircraft engine compressor measures 12 inches in diameter and has a minimum density of 4.51 g/cc. It is made by Clevite Research Center for Allison Div., GMC.



STARTING WITH A SINTERED SLUG, this titanium shell casing is formed by five successive stages of impact extrusion and spinning. Clevite Research Center.

ratio of fatigue strength to static strength of this material, 0.38, is equivalent to that of Rem-Cru 70 titanium; contrast the ratio of 0.15 for 75-S aluminum and 0.23 for SAE 4340 steel. The impact strength down to -300 F for hot-pressed Ti-Brush 40 remains above 30 ft-lbs which is also equivalent to the behavior of commercially pure arc-melted metal.

From the available information it is apparent that powder metallurgy parts of unalloyed titanium can be made with properties equivalent to commercially pure arc-melted titanium.

It is possible to make higher-strength powder parts than was reported. Although this could be done by oxygen and nitrogen contamination, it is more desirable to accomplish it by adding other alloying elements.

Experiments are being carried out on the synthesis of alpha and alpha-beta alloys. The Clevite Research Center is experimenting with Ti-2A1 and Ti-4Mn-4A1 alloys. Robins, Pitkin and Jenkins of the General Electric Co., Ltd., in Wembley, England have made binary titanium-chromium and titanium-molybdenum alloys containing up to 10 percent of either alloying element by the hydride process. The problems of homogeneity were reported as having been overcome. The homogeneity of these alloys is dependent upon the extent of mixing of the powders as well as the diffusity of the alloying elements. Molybdenum required more complete mixing and the addition of massive titanium during mixing.

The alloys did not develop outstanding properties and good ductility, probably due to three reasons:

1 High content of oxygen and nitrogen in the base metal,

2 Sintering treatments at high temperatures which produced large beta grains, an undesirable starting structure.

3 Use of non-optimum heat treatment procedure.

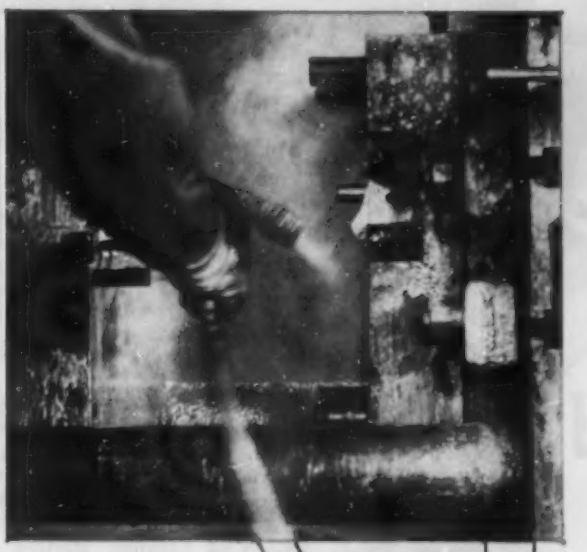
Items 1 and 3 can readily be corrected. High-sintering temperatures are necessary to obtain proper densification. However, the use of alloys containing aluminum would reduce the danger of excessive beta grain size, possibly permitting sintering in the more desirable alpha-beta region.

The use of deformation during sintering as in the hot pressing method of Clevite Center, or the use of the sheath working method, would further contribute to obtaining a desirable structure. The available information indicates that making of alloyed titanium parts with desirable properties by powder metallurgical methods is feasible and can be achieved.

The advantage of powder metallurgy methods over arc-melting and forging, as in the case of other metals, is related to reduced costs: minimization of scrap loss, volume production and base metal saving. H. W. Dodds reported results of a jet aircraft engine company study on methods of fabrication

Continued on page 44

'dag' dispersions... *a touch does so much!*



Bendix uses 'Aquadag' to boost die-casting production

The die-casting of magnesium and aluminum presents unusual problems that make the selection of a die lubricant vitally important. Bendix Foundries, Bendix Aviation Corporation, Teterboro, N. J., has found **'Aquadag'**, a dispersion of colloidal graphite in water, most effective in the quantity production of magnesium jet-engine components and aluminum instrument die-castings.

Standardizing on a simple, economical 1:40 dilution of **'Aquadag'** in water, Bendix finds that the thin, tenacious *dry lubricating film* formed on the dies by this blend produces consistently uniform die-castings. In addition, easier parting, reduced tendency for the molten metal to alloy with the steel dies, and less frequent application, have all helped to increase production substantially.

Full information, telling how **'dag'** dispersions can improve *your* die-casting production, is contained in the Acheson Bulletin 425 on Metal Casting Operations. Write for your copy today. If you have a specific problem there's an Acheson service engineer in your area who will be glad to work with you.

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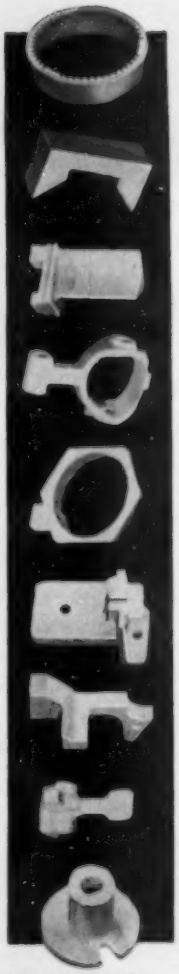

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to produce a bearing housing. For a bearing housing of one pound, 8-10 pounds of sponge titanium would be required in the arc melting and forging process. The Clevite Center has been able to make these bearings using 1.9 pounds of starting material. The large reduction in starting material effected a 20 to 25 percent saving on the end cost of the items.

Such large savings in material offer an obvious field of exploitation by powder metallurgy. The Utica Drop Forge process requires only 1.1 lb of titanium powder per pound of finished parts, thus showing considerable promise for commercial development, providing the high sintering temperature of 2100-2200 F does not introduce significant amounts of contamination and therefore brittleness.

J. F. Sachse of Metals Disintegrating Co., at the May 1955 meeting of the Metal Powder Association, indicated that the cost of titanium powder was then $15.00/lb as compared to structural shapes of titanium starting at about $20.00/lb. This price differential offers an incentive "to adapt powder metallurgy fabrication to the production of structural parts." Where intricate parts must be produced in quantity, like a turbine blade with undercuts and threads, the prohibitive machining costs would give powder metallurgy methods a very distinct advantage.

In order that this incentive be maintained, it will be necessary in time to lower the cost of titanium powder. This follows from the fact that as the output of titanium products increases the cost of structural parts will decrease. Improvement in mill processes to reduce scrap losses and increased use of scrap will further reduce costs.

During sintering, contact of titanium compacts with air must be minimized to avoid embrittling effects. As was indicated in the preceding article, a recent patent suggests that sintering in the vapor or liquid of a metal more reactive than titanium would eliminate the need for vacuum apparatus thus reducing costs for processing titanium powder parts. Aside from the possible disadvantage of entrapment of this pro-

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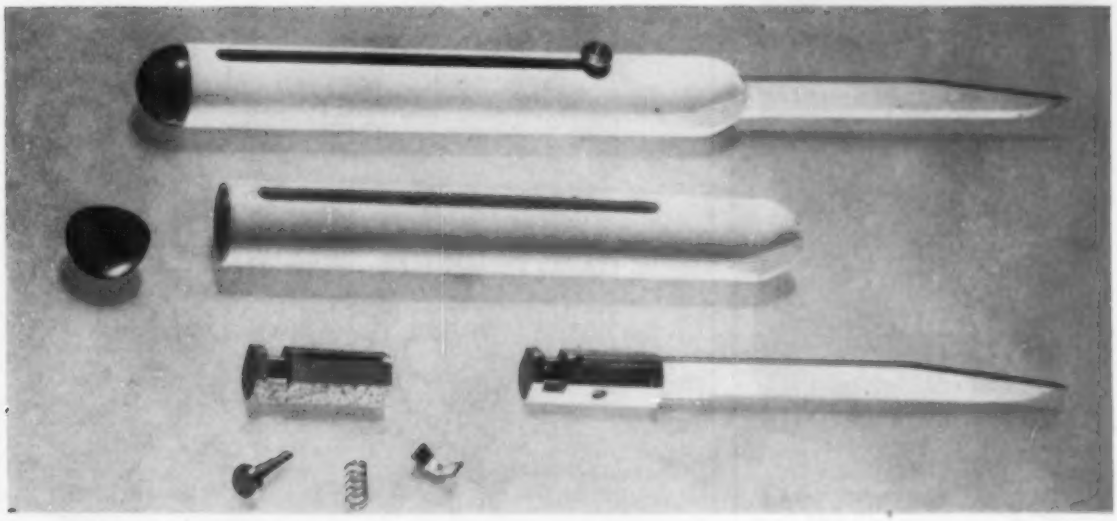

1. PERMANENT LUBRICATION of the blade-holding shank of this pocket knife is gained by making it from copper powder and lubricating with stainless grease.

Drill One Hole And It's Finished

"Service life of these sliding-blade knives has been exceptionally good in the seven years since we introduced a powdered copper shank . . ."

By R. S. KRAUSE
Product Line Director
Autopoint Co.
Div. of Cory Corp.

ADVERTISING specialties are manufactured at very low cost. But, because these specialties reflect the reputation of the company giving them away, they must be of good quality.

These two basic considerations are reflected in the sliding blade knife shown in the illustration. The blade must be of good quality steel so that it will take and hold a sharp edge, it must function mechanically well for a reasonably long period of time and, finally, it must be produced sufficiently inexpensively so that advertisers can afford to purchase large quantities of the knives and give them away.

In today's labor market, if a product is to be produced at a low unit cost, the amount of hand work must be held down. Every time a part is picked up and an operation done on it by hand, the costs sky rocket. For these reasons, therefore, *this knife has been designed so that every piece on it can be mass produced on fully automatic machines.* The result is that, except for drilling one small hole, the only hand work is assembly and here adequate jigs and fixtures have been devised to speed up this operation so that labor costs per unit are held down.

Of particular interest here is the blade shank. This shank is made from copper powder by the Chicago Powdered Metal Products Co. and is furnished by the fabricator completely formed except for the lateral hole used to fasten the shank to the blade.

Other conceivable methods of manufacture of this part would be as a screw machine operation, starting with extruded stock or die casting. In the first case, both raw material costs and the plurality of operations would run the costs higher than could be allowed for such a part. In the second case, the high replacement costs of core rods would make the unit costs considerably

Continued next page

THIS PLUNGER RING CAN SAVE YOU MONEY ... TIME and Eliminate Lost Production

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Precision Un-Breakable Plunger Rings are made of tempered and treated stainless steel. They are wrought, *not cast*, from dense, fine grain, flawless stainless steel. Engineered specifically for die casting machine applications, Precision Stainless Steel Plunger Rings give up to 8 to 10 times the average life of other rings. Produced under the most exacting methods, uniform tension and resiliency with long wearing, un-breakable and heat resistant qualities make it possible for plunger, groove and sleeve tolerances to be greater, thus eliminating unnecessary wear. Precision Rings are designed to allow for expansion under extreme heat and this feature with the characteristics of the stainless steel assures the finest, most dependable die casting plunger ring made.

Rings can be supplied in ¼" widths from 2¾" diameter up. They can be made to special diameters and widths.

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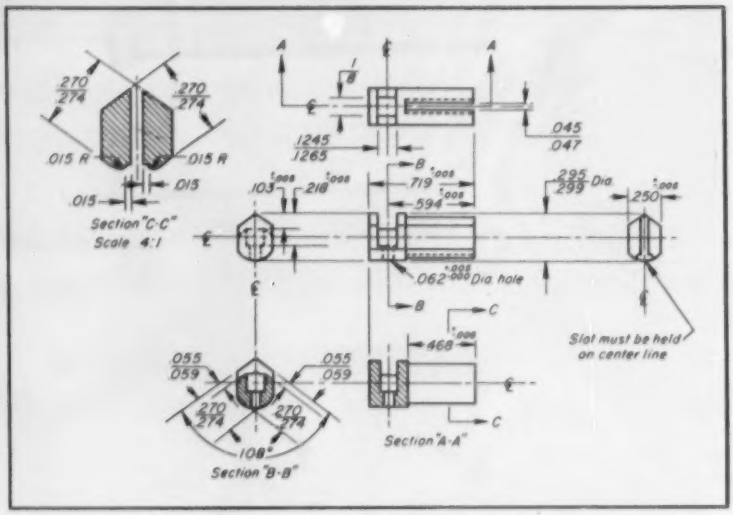
There are no loose tolerances on this piece . . .



2. ABILITY TO REPRODUCE CLOSE DIMENSIONS is one feature of powder metallurgy that has been put to good use in designing this shank for a sliding-blade knife. Note that no dimension on which a decimal tolerance is given is greater than ± .005 and many are much closer. This is necessary to gain proper fit inside the knife case and firm anchorage for the knife blade.

Drill One Hole — Continued

greater than the unit costs by powder metallurgy.

Service life, another important consideration, is considerably greater with a powder part than when any other method of fabrication is used. Because the shank must ride against a brass strip which carries a part of the blade position locking device and the case, it is desirable that some form of lubrication be employed. Here the unique structure of a powdered metal part allows impregnation with a stainless grease so that adequate and permanent lubrication is assured. This grease is effective against both the brass strip and against the No. 2 Tenite case so that the life of the knife is not limited by wear of these parts.

To prevent movement of the blade in the shank and to prevent unwanted movement of the entire blade assembly in the case, the fits must be held close. The dimensional accuracy required on the shank is shown in the drawing in Figure 2. It will be noted that the loosest tolerance is ± 0.005 and, in most cases, dimensions are held to a total variation of 0.004 or less. As in most cases of successful application of metal parts, all dimensional tolerances were arrived at as a compromise between the vendor and the customer. This has resulted in a low cost part designed so that both parties can live with it.

Drill breakage problem

Mention was made above that the shank must have the one rivet hole drilled in it. This hole is approximately 1/16" in diameter and has presented a considerable problem. It is well known that the machining of powdered metal parts is best done with carbide tipped tools. This is particularly true of the porous parts such as this blade shank. *Due, however, to the very small diameter of the hole, it was found that drill breakage was excessive and for this particular operation, a high speed steel drill has proven to be the most economical.* This economy is true in spite of the relatively high frequency of sharpening that is required.

Service life of these sliding blade knives has been extremely good. In over seven years of use of the powdered copper shank, there has never developed a case of knife failure due to excessive wear of the parts.

How To Control Temperature In Die Casting Dies

Part 1 – Mechanics Of Heat Transfer

By W. M. HALLIDAY

TWO vitally important and closely related practical requirements for successful pressure die casting, are commonly overlooked, or only imperfectly satisfied when designing, constructing and operating dies:

1. The maintenance of the die temperature consistently within the prescribed range of optimum operating temperatures.

2. Insurance that die heat is distributed in the most uniform manner possible around the critical cavity, core, runner and sprue formations.

These two requirements have always to be satisfied in such a manner as to insure the closest stability of die temperature over *long periods of continuous operation*, to give smooth, trouble-free, efficient production running of the tool, and maximum freedom from irregularities or discrepancies in finished die cast parts.

Castings having close precision dimensional features, superior quality finish, or high strength characteristics combined with minimum wall thickness are difficult to produce from a die whose heat fluctuates abnormally, either much above or below the optimum working temperature or where there are great variations in heat distribution over vital portions of the tool. Greatest objections generally arise where the die temperature is permitted to drop substantially below the optimum level.

Temperature Range. Ordinarily, the range of permissable die-temperature variation is very small indeed with most of the common alloys in regular use.

In practice, it will rarely be found feasible to allow the total fluctuations in die heat range over more than about 40-50 degrees. Even such a fine range of temperature variation has to be carefully controlled so that the maximum is never more than approximately 30 degrees above the optimum value; nor allowed to fall more than about 20 degrees *below* that optimum level. Stricter adherence to this lower limiting temperature is usually necessary in practice.

This is because an *unduly cool die* generally is the source of a greater number of more serious operating troubles and/or faults in die cast articles, than a die which is habitually run too hot. An excessively hot die can also lead to several difficulties in operation and defects in finishing castings, however, and should be rigorously avoided.

Heat Control. The very restricted range of permissible temperature variations is, in itself, a

Continued next page

WATCH THESE 11 FACTORS THAT AFFECT DIE TEMPERATURE

The chief factors which determine working temperature in a particular die, and the degree of variations likely to occur, are:

1. The temperature of the alloy charge at the instant of injection into the die.

2. The velocity of the injected molten charge of alloy when entering the die.

3. The rapidity at which alloy charges are successively injected into the closed die.

4. The size and mass concentrations of the die members, particularly those portions most intimately in contact with the molten charge.

5. The size and disposition of cavity and core formations in the die.

6. The type, capacity and lay-out of sprue, runner and gate channels feeding the die.

7. The speed of ejection of finished castings.

8. The general wall thickness and the degree of uniformity of same in the casting.

9. The complexity of the die mechanisms, notably those operating cores or ejectors.

10. The general overall heat-radiating capacity of the die.

11. The character of inserts employed for casting in situ, ie their size, kind of metal, location, manner of mounting and fixing in the cavity.

practical obstacle towards the exercise of effective heat control or the establishment of thermal balance in the die. Its attainment requires close regulation of numerous other factors connected with die design, the character of the casting and general working conditions. These are also the factors which determine the optimum temperature at which the die may be worked. Many of these factors are extremely variable and interdependent. Most of these factors, especially those associated with the die, cannot be automatically controlled by mechanical means to precision limits, in the same way, for example, that the temperature of the molten alloy charge is thermostatically controlled. The practical outcome of this limitation is that the die caster has to resort to *extemporized means* for achieving heat control.

Most of the above factors are closely tied up with the die design and construction. Thus, their influence will vary greatly with different types of dies and the kind of casting being produced. For this reason it is difficult to specify wholly reliable empirical rules and practice for controlling die heat. Most die casters, in fact, determine the optimum working temperature of the die, as well as the character of controls, by carefully observing the influence of the foregoing factors during the trial run of a new die.

On the other hand, because many of these factors are so closely associated with die design, it is often possible to foresee their influence upon a projected die design and upon thermal balance. In other words, it is feasible to determine whether untoward heat variations are likely to occur, and what form of heat control must be employed in a die to regulate it. This presupposes that careful consideration be given to the problems of heat transference and dissipation arising with alloy, machine and die, at a *sufficiently early stage* in the development of the tooling.

Plan Heat Control Early. Unfortunately, this aspect of die design is frequently overlooked and sometimes deliberately relegated until a much later stage is reached in the actual construction of the die. It is, indeed, common practice to defer serious consideration of die heating problems and the means of control until the tool has been completed and subjected to 'proving tests' on the machine. In the light of experiences gained by running the die and viewing the quality of sample castings, etc., decisions are then taken concerning die heating conditions.

This practice, often results in the adoption of makeshift heat-controls which produce unsatisfactory regulation. This usually occurs because it will frequently be found that the most efficient provisions for controlling heat cannot be embodied in such a *finished* die construction owing to the drastic, protracted and costly alterations involved.

The die-temperature is always a complex problem because fluctuations in working temperature seldom originate from a *single easily isolatable* cause. The proper evaluation of the thermal effects of the numerous variables can only be made on the basis of a full understanding of the mechanics of heat transfer between the mol-

Continued on page 65

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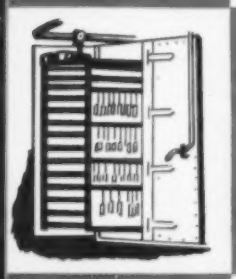
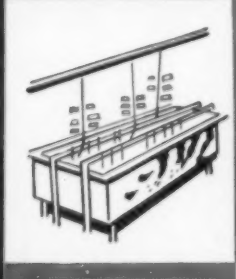
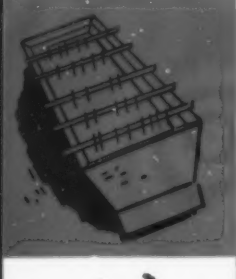
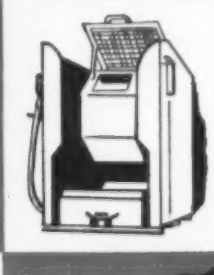




PMM

Finishing Section

Finishing includes all secondary operations performed on precision metal molded parts — up to and including final surface treatment. This section presents new information about the specialized methods, equipment and materials needed for finish-machining, assembly, surface preparation and final finishing of all precision metal molded parts.

devoted to the specialized problems of finishing . . .

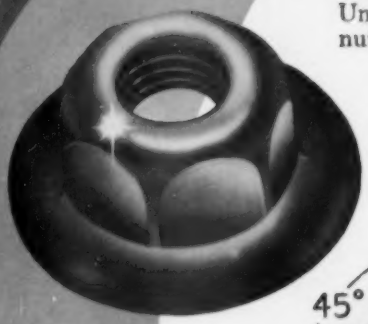
DIE CASTINGS • INVESTMENT CASTINGS • PERMANENT MOLD CASTINGS • PLASTER MOLD CASTINGS • POWDER METAL PARTS • SHELL MOLD CASTINGS

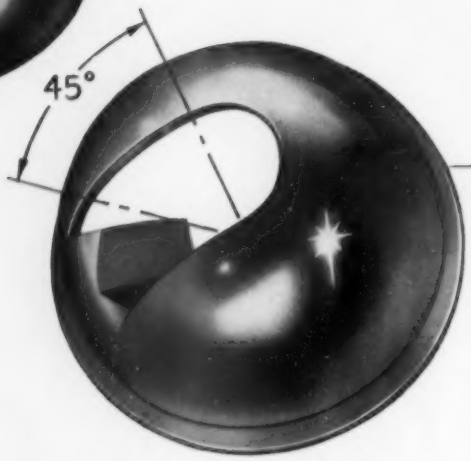
DOT's new angle washer holds cast trim against curves

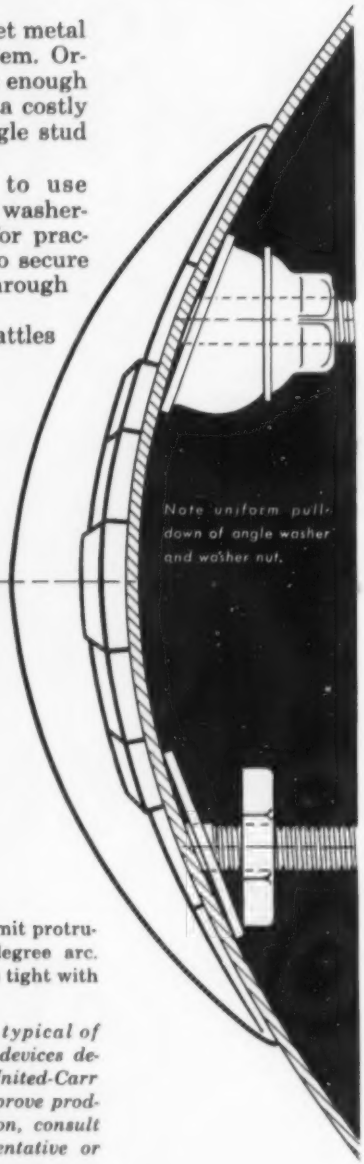
Fastening die-cast trim to curved sheet metal surfaces can be a troublesome problem. Ordinary nuts jam before they get close enough to hold tight. One solution has been a costly mould construction permitting off-angle stud casting.

The modern cost saving way is to use United-Carr's new angle washer and washer-nut combination. This compensates for practically any curve or can be used to secure studs that protrude at an angle through a flat surface.

Tight fastening is assured and rattles never get a chance to start.







Light, strong metal shell is slotted to permit protrusion of stud at any angle within 45 degree arc. Washer nut matches shape of shell, locks tight with normal wrench torque.

The angle washer and washer nut are typical of thousands of special-purpose fastening devices designed and manufactured in volume *by United-Carr to help speed assembly, cut costs and improve product performance. For further information, consult your nearest United-Carr field representative or write us for his name and address.*

UNITED-CARR Fastener Corp.

31 Ames Street, Cambridge 42, Mass.

MAKERS OF DOT FASTENERS

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CHILL IT . . .

A four-hour freezing cycle after heat treating is applied to high silicon aluminum alloy castings.

AND MILL IT

Pent-up stresses that would distort the casting ordinarily, are relieved by freezing. Machining is simplified.

Photos: Cincinnati Sub-Zero Products

To Reduce Dimensional Change During Machining . . .

Deep Freeze Your Castings For Stress Relief

THE heat treating department of tomorrow may have a deep freeze unit alongside its furnaces. Work done by the Power Products Div. of Canadian Westinghouse Company shows that chilling aluminum castings prior to machining has a favorable effect upon their dimensional stability.

Castings which have a tendency to "move" as a result of the release of internal stresses during machining, can benefit from the low temperature treatment. Here's how it works.

After normal heat treating, the castings are placed in a freezing unit where temperature is dropped to −120 F in a Sub-Zero chilling unit. The work is left at this temperature for about four hours, in a typical cycle, and then removed from the chilling chamber. They are allowed then to return to ambient temperature and are ready for machining. They need not, however, be immediately machined, but this can be done at any time after chilling.

What is accomplished? According to Westinghouse engineers who conducted preliminary research on the project, stress relief is accomplished by the development of plastic deformation. Very slight, if any, metallurgical changes occur.

In quenching the alloy during heat treatment, high internal stresses are set up within the casting, the skin stresses being close to the yield point of the material. These stresses remain in the material after heat treatment.

Due to the relatively high coefficient of expansion of aluminum . . . about 2 mil per inch per 100 C . . . it is believed that the contraction upon cooling increases stresses to a point above the elastic limit of the material. At this point, plastic deformation occurs, largely cancelling the internal stresses.

Most of the work so far has

Continued next page

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MEMO:

If you melt metal

Assure prompt receipt of technical data on our new chemical and metallic additions for non-ferrous castings.

Circle #48 on your reader's service card to place your name on our mailing list.

ROSSBOROUGH SUPPLY CO.
3376 WEST 137th ST.
CLEVELAND 11, OHIO
PHONE: WINTON 1-6115

been done with Alcan aluminum alloy 135-T22, a high silicon alloy for sand or permanent mold casting that is used where high strength, corrosion resistance, pressure tightness, and/or dimensional stability are required.

The 135-T22 solution heat treatment and aging consists of heating at 995 F for 12-16 hours, quenching in hot water, reheating to 320 F for four hours, and then air cooling. Even though the hot water quench is designed to minimize stresses and distortion from quenching, Canadian Westinghouse had been experiencing great difficulty in machining certain aluminum castings. The new chilling treatment has been their answer to the problem.

The old system called for three separate machining operations, with a 24 hour "rest period" between operations. For example, in the first setup, the castings were machined to within .032 of finished dimensions, then removed from the fixture and allowed to "rest" for a day. Then machining was repeated to within .010 of finished and again put back on the shelf for a day. Finally, it was cut to finish dimension.

Now, with chilling prior to machining, castings are set up and machined to .010-.015 on all surfaces and then finished to specifications. No time lag needs to be allowed. Thus, chilling saves two setups and one complete machining operation. Time and extra handling are saved.

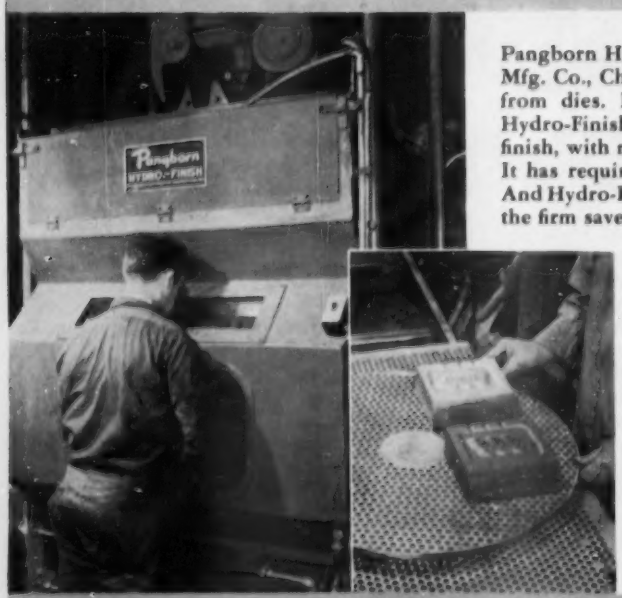
On a single order involving eleven different types of castings, Westinghouse figures, savings approaching $40,000 were realized with this chill-treatment.

Other alloys can also be chilled. Although most work has been done with Alcan 135-T22, it has also been tried successfully with Alcan 350-W and bronze PDS 5-1 (ASTM B-143 Alloy 1B), as well as certain high carbon, high chromium tool steels.

On alloys 350-W and PDS 5-1, the castings get two chilling treatments of four hours at −120 F and are allowed to return to ambient temperature between treatments.

One impressive experience in converting to the new type of treatment concerns a flat door casting 27″ x 6″ x ⅜″. Following the former triple-machining practice, average deviation from the flat was .020/.025. Using the new system, average deviation has been reduced to .002/.005 and milling time has been reduced by an average of 12 hours.

Pangborn HYDRO-FINISH wet blasting saves $22,500 a year for Imperial Brass!



Pangborn Hydro-Finish wet blasting is used at Imperial Brass Mfg. Co., Chicago, to remove heat scale and carbon deposits from dies. Imperial Brass is highly gratified with results. Hydro-Finish does a perfect cleaning job and gives a smooth finish, with no breakdown of sharp edges or loss of tolerances. It has required no maintenance in its 1½ years of operation. And Hydro-Finish has cut time and labor costs so drastically that the firm saves $22,500 a year on this step alone!

If *you* clean dies and molds, you should investigate Pangborn Hydro-Finish . . . now offering even lower investment and more efficient operation by using air jet sluriators instead of a pump. Write today for Bulletin 1402 to PANGBORN CORPORATION, 3500 Pangborn Boulevard, Hagerstown, Maryland. *Manufacturers of Blast Cleaning and Dust Control Equipment.*

Pangborn
BLAST CLEANS CHEAPER

3H

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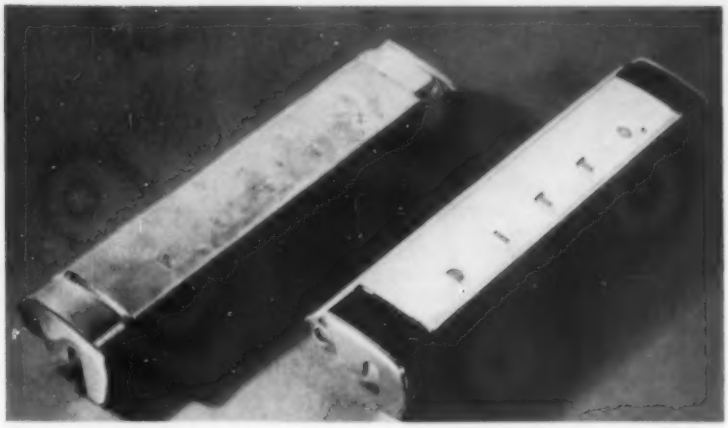
POLISH is accomplished by manual application of the casting to a cloth wheel. Off-hand polishing gives good quality surface.



PAINT is applied by manual spray gun, while masking of edges is done by the simple method of using self-adhering tape by hand.

BAKE in batch type oven takes about a half an hour. This requires no special installations.

Quality Finish Can Be Keyed To Limited Production

BECAUSE permanent mold casting in aluminum base alloys can be produced with such a dense surface, the amount of finishing, both as to number and length of operations, can easily be greatly reduced. As a result, surface finishing of these parts is far less costly than the finishing of a comparable sand cast part.

The ejector frame casting shown above used by Ditto, Inc. on the Ditto offset printing machine is one example of the simplified finishing of permanent mold castings, economical, even in limited quantities.

The casting is supplied by Acme Aluminum Foundry Co.; except for drilling and tapping operations it is substantially complete and ready for surface finishing as received. All gates and flash have been removed and surfaces where they occurred have been sanded smooth. After necessary machining operations have been completed, the part is washed and degreased before going to the finishing department.

In finishing, the exterior surfaces are polished using a cloth wheel and stick abrasive, top left. Only enough surface metal is cut to remove slight variations and bring the entire surface to a uniform condition. Since the majority of the polished area is a smooth uniformly curved surface it is essential that there be no deviations in flatness or curvature that would be accentuated by polishing.

A color buffing step follows the polishing to bring out the natural brilliance and white color of the aluminum alloy.

As can be seen, two end areas are painted. Since, at the present time, this machine is still in limited production, the painting is done by hand. The polished areas are masked off with a contact adhesive tape and the paint applied with a hand held spray gun, center left.

As soon as the paint has dried slightly the masking tape is removed. But the name must also be brought out. This is done by filling the depressed letters with paint, again with a spray, and then wiping immediately so that none of the paint adheres to the polished surfaces.

Finally the paint is baked. A 30 minute cycle is generally sufficient at a 275 F. Photo, bottom left, shows the finished parts after removal from the drying oven.

INSPECTING THE QUALITY of some small zinc die castings from a barrel load are Joseph Ceravole, left, production supervisor, and D. J. Altamura, head of the barrel finishing department.

Combined cut-and-color cycle helps get speed and versatility needed for big-volume output . . .

Barrel Finishing In A Job

HOW does a topnotch job plating shop produce quality finishes on die castings at prices competitive with in-plant finishing departments? An East Coast commercial electroplating plant that is doing a large volume of finishing for customers over a wide geographical area, some located as far away as Western Michigan, gives credit to an efficient barrel finishing operation for much of its success.

In a typical day, the barrel finishing department at Electro Plating Service, Inc. of White Plains, N. Y., processes about 160,000 pieces during one and a half shifts. The majority of this work is performed on zinc die castings being prepared for plating.

Five men operating an eight-barrel tumbling department keep pace with a 100-man electroplating line. To get the most out of this compact tumbling department, Joseph Ceravole, production supervisor, and Dominick J. Altamura, head of the barrel finishing department, have cut barrel cycles as short as possible, consistent with the finish desired.

They have standardized on cer-

Some points you should consider in setting up a barrel finishing

IN selecting the proper combination of factors, from among the numerous factors that influence the quality of finish and speed of operation, the following are important considerations.

1. **Chip selection.** Size of chip is of great importance. This can affect the rate of cutting (hence, total operating time), quality of finish obtained, ease of separating work from chips, and the preservation of the vital, dense outer surface of the castings.

One important means taken by Electro Plating Service to expedite the barrel operation has been to combine the cut and color operations, where shape, size and starting condition of the castings permit. The economy is apparent . . . one complete operating cycle is saved, along with the "down time" otherwise required to flush and recharge the barrel. Choosing exactly the right size chip is essential to one-step cutting and coloring.

However, chips must not only be selected for their cutting or burnishing action, but also for their relationship to the size of the workpieces. Chips must be sufficiently different in size from the castings in order to expedite separation by a simple screening operation.

Castings must also be selected that will not lodge in holes in the castings. Hand removal of chips is wasteful and unnecessary.

When all these factors are considered, some compromise is usually necessary . . . a chip that is small enough to give the needed color quality may also lodge in cored openings; a chip selected large enough for rapid and economical metal removal may be of such a size that it is difficult to screen from the castings; a chip that gives good color may work too slowly for efficient production scheduling.

2. **Compound selection.** Equally important has been the choice of compounds. The compound must be one that maintains the high color on the castings and must also help to get a mild cutting action without nicking. This is accomplished partly through a "cushioning" action. Where nicking is a problem, the cushioning effect of a sudsy compound prevents damage to the castings.

However, some compounds containing soap, cautions Mr. Altamura, may darken zinc die castings or leave an insoluble precipitate film in the form of a hard-to-remove scum, depending upon the type of soap. Soap-containing compounds should be tested to determine this.

A sequestering action is also desirable to help prevent soil from redepositing on the surface, particularly small metal chips or fragments of flash that can be inseparably hammered into the surface of the castings.

The barrel compound used now for more than a year on all jobs by Electro Plating Service is a material called Burnamite, a homogeneous powder produced by Rutley Industries, Inc.

3. **Barrel operation.** Like the size and type of chip, the size of barrel, rate of rotation, relative quantities of work-chips-water-and-compound and the length of operating cycle will affect the finish achieved.

The company is using Roto-

Plating Plant

tain equipment and materials to reduce the number of variables, and have, where possible, combined cutting and coloring into a single operation.

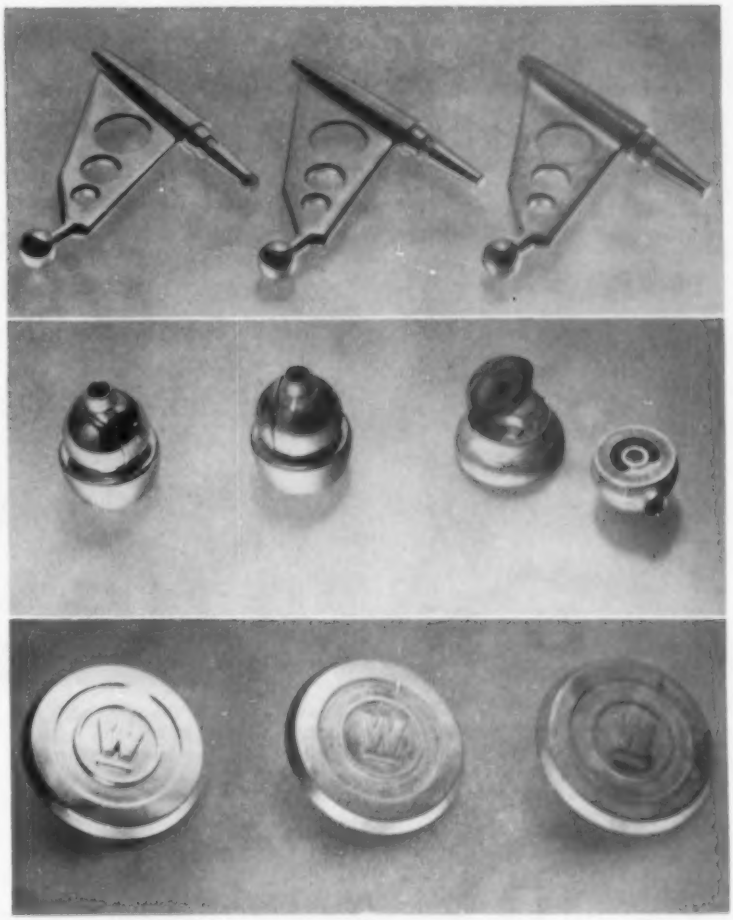
Die castings that go through their lines range from tiny die cast control knobs and electric shaver components to large automotive trim parts and bezels for clock radios.

department

Finish barrels throughout, principally three-compartment 36″ units with variable speed controls. Control of speed is important, the company reports, because the slower the speed, the more gentle the movement of chips against work and the smoother the finish. At slow speeds, a sliding action is produced, rather than a dropping and striking action. With shapes that have projecting surfaces that might cause nicking, slower speeds are used.

A typical work load has the barrel about two-thirds filled with work and chips, with water level with the top of the mass. For coloring, about three pounds of compound are added; for cutting, half the amount of compound and a lower water level are used.

Length of cycles vary, but the average cut-and-color operation takes about 1½ hours. The longest job time for a heavy cutting tumble is about eight hours. On the other hand, a light deburring where color is not important, such as the removal of a burr from an electric razor casting, takes only half an hour.



ELECTROPLATED BARREL FINISHED AS CAST

TWO OPERATIONS ARE NEEDED to barrel finish the mirror arm die castings, *top*, with the cutting and coloring cycles each running about 1½ hours. Main difference is lower water level and smaller amount of compound used for cutting.

FINE SERRATIONS on these mating die castings, *center*, require special care in the selection of a barrel finishing cycle in order to preserve the clean, sharp serrations obtained on the die castings.

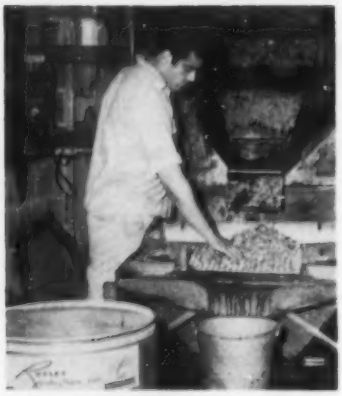
DECORATIVE EMBLEMS and trademarks produced by die casting can readily be cut and colored in one operation, ready for plating without further processing. Care must be taken to protect the detail while bringing up the color.

CASTING QUALITY
CASE STUDIES

SET UP FOR HIGH PRODUCTION FINISHING

THESE FIVE MEN keep 100 men busy electroplating. This is the work shift required to process about 160,000 zinc die castings per day as a preliminary to chromium plating. Three-compartment 36-inch barrels have been standardized in this department. Choice of compounds and media have also been simplified for greater efficiency.

CUSHIONING ACTION of the barrel compound helps to prevent nicking. Pointed ends of the castings have a tendency to nick other castings unless speed, compound and water level are properly adjusted.



RAPID SCREENING is an essential to the high rate of production needed in a job finishing shop.

Influence of Casting Quality

The starting point in any barrel finishing cycle must be the quality of casting surface as received. When a hardware quality surface is to be finished. a relatively short run can be planned. However, barrel finishing cannot be counted upon to remove deep surface defects. Polishing and cutting action long enough to remove flow marks and cold shuts is likely to damage the castings or, at least, cut all the way through the protective outer skin.

Another argument against using barrel finishing to polish out surface defects is that the metal removal is not selective; while the defects are being removed by prolonged or fast-cutting barrel action, much of the casting detail may also be removed. Since superior surface detail is one of the primary reasons for using die castings, this type of barrel operation cannot usually be tolerated.

Trimming should also be carefully done when die castings are to be barrel finished. The closer the trim, the shorter the cutting cycle and the less likelihood of nicking.

Many die castings come into the barrel department having already

had a light cleaning operation on a grease belt, especially along the parting line. This is a worthwhile operation that saves many hours of barrel time.

Application of Barrel Finishing

Each die casting must be studied on its own merits when setting up a barrel finishing operation. Some examples of typical castings processed by Electro Plating Service are described:

Antenna base castings presented a severe problem due to the sharp point at one end. In the tumbling operation, this would tend to nick other surfaces on which it impinges.

The castings are received with compartment barrel with approximately 250 to 300 pieces per load. a hardware finish suitable for optimum quality of finish. The edge has been touched with a light grease belt.

This casting runs in a standard three-compartment barrel with approximately 1/3 parts to 2/3 media. A small chip was found to be unsatisfactory in this case because of the cutting action required. A medium sized chip was used along with about 3 pounds of Burnamite to obtain the required finish.

The cushioning effect of the compound helps prevent impingement and also lubricates the castings as they move against each other. It was determined that both cutting and coloring could be done together due to the good starting quality of the cast surfaces. This part requires a slower than normal tumbling speed to further reduce the danger of nicking.

Mirror Arm Castings required two operations, due mainly to the greater weight of the castings and the greater amount of metal to be removed. The only difference between the cutting and coloring operations here is the lower water level and smaller quantity of compound used.

On the cutdown cycle, the load runs about 1½ hours with water level somewhat below the surface of the mass. About 1½ to 2 pounds of compound are used. Then the barrel is rinsed out, leaving the same chips in the barrel, and it is recharged. Coloring takes about the same length of time as cutting. Speed is controlled to 12 to 14 rpm for both cycles.

Clock-Radio Bezel was a difficult casting to barrel finish because of its long, thin wall section that is likely to be damaged by too severe a tumbling action. Also, some of the interior surfaces that are difficult to reach with buffing are expected to be colored in the barrel operation. Some of these are also difficult to finish in a barrel. As a compromise, the top edge is buffed on a wheel, and the interior surfaces, including concave surface detail, are satisfactorily loose tumbled.

ASM HOLDS SYMPOSIUM ON VACUUM METALLURGY

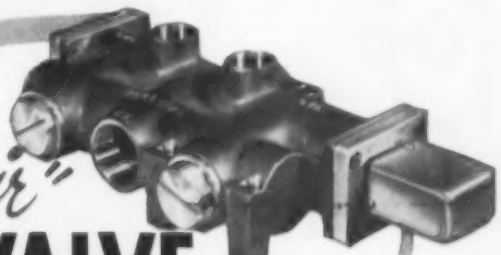
The Tenth Biennial Pennsylvania interchapter meeting of the American Society for Metals will be held at University Park, Pa., on Friday and Saturday, September 7 and 8, 1956, under the auspices of the Penn State Chapter. The Department of Metallurgy of the Pennsylvania State University will be host along with the ASM Chapter.

The technical meeting will have as their theme: "Vacuum Melting and Casting as Metallurgical Operations." Outstanding speakers will present the papers.

In addition to the host chapter, Lehigh Valley, Northwest Pennsylvania, Northeast Pennsylvania, Philadelphia, Pittsburgh and York Chapters are participating.

All members of the participating chapters will receive housing reservation cards about two months before the meeting and others may obtain them by writing to Prof. H. M. Davis, Division of Metallurgy, Pennsylvania State University Park, Pennsylvania. here.

NEW



"Bel-air"
AIR VALVE

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This one important Bel-Air feature completely eliminates the problems of accessory speed control valves and cumbersome extra piping. Bel-Air Valves offer many other significant design features for decidedly better control . . . decidedly better performance. Quick air cylinder response is assured by 50% oversize piped exhausts. All ports are screened for extra protection against abrasive action. Aluminum valve spools literally float on jumbo seals inside a hard-chrome plated sleeve. All models are easily serviced with air lines connected. Available in single or double-solenoid pilot-controlled models in sizes of ¼" to 1¼", and in a variety of manual or mechanical controls in sizes of ¼", ⅜", ½"

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AKRON, OHIO

Sensational Development in Barrel Finishing...

HOW NEW ALMCO AUTOMATED SYSTEM

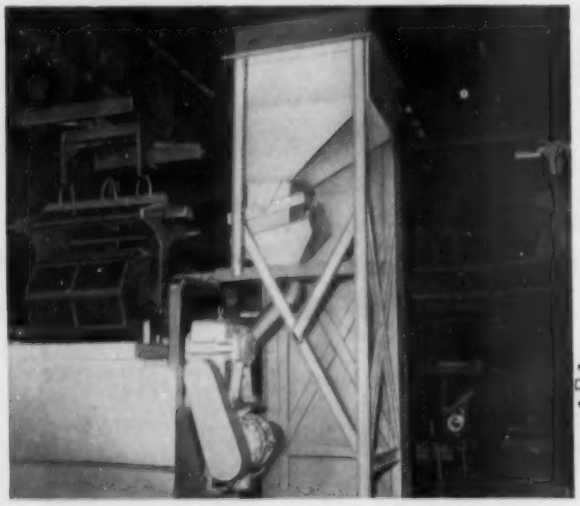
CUTS DEBURRING AND FINISHING COSTS PER PIECE ON 1½ MILLION PARTS EVERY WEEK!

● This tremendous savings is being enjoyed by a major automotive manufacturer. The Almco Sub-O-Matic Automated Systems pictured here are deburring and finishing machined, centerless ground metal parts and stamped parts to micro-inch precision.

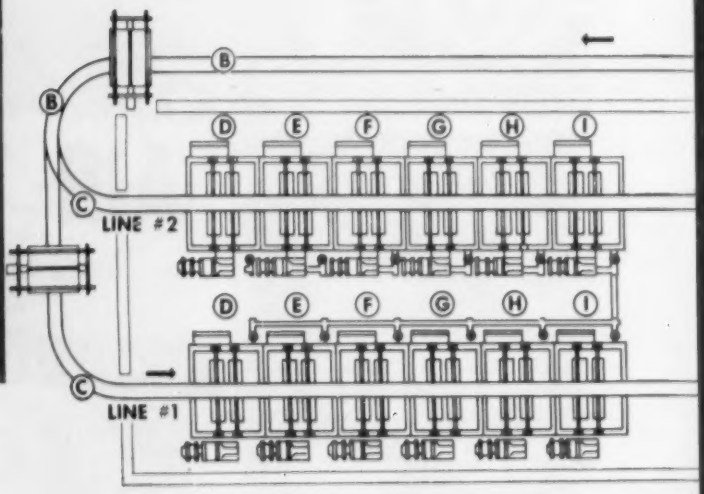
Tolerance limits on radii are ± .0005, with a 7 to 10 microinch surface requirement. These rigid specifications were formerly very costly to achieve on a mass production basis.

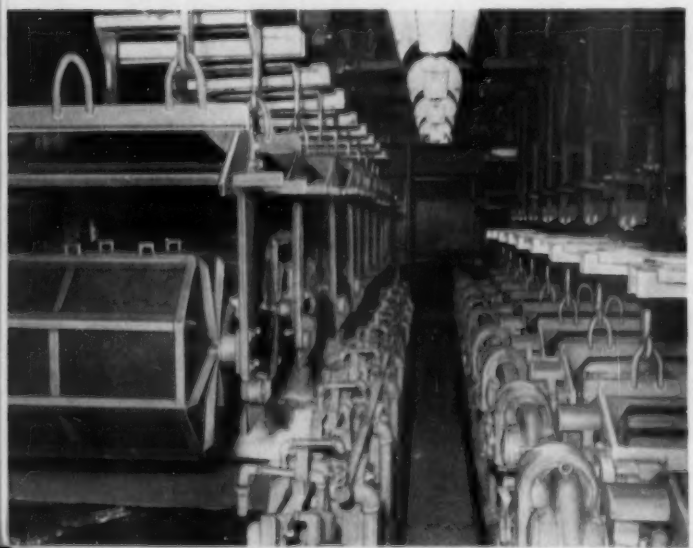
Utilizing the "submerged" type of barrel finishing, the Almco system is meeting these requirements, and cutting costs on *every piece processed*. Follow the story, and see how it's done!

a. Operator pushes a button and pre-determined amount and sizes of abrasive chips flow through a swivel-chute from an overhead storage bin into the barrel. Work parts are loaded (manually or mechanically), easy-handling door is closed, and the barrel is ready to enter the system.



b. The barrel rises automatically from the loading-unloading station and is travelled by power-and-free conveyor to head of the finishing lines. An automatic walking beam alternately feeds two submerged-type barrel finishing lines.





c. Barrels in each line index simultaneously from one tank to the next at pre-selected time intervals. Descaling, deburring, grinding, burnishing, coloring, rinsing and rust inhibiting are automatically performed in sequence. Upon completion, barrels travel to loading-unloading station.

PRODUCTION FLOW CHART

(diagram below)

Two 6-station submerged lines. The lines are serviced by automatic walking beams . . . each indexes six barrels every 5 minutes from tank to tank during processing cycle.

Time cycle: 30 minutes per barrel. One barrel of finished parts completed every 2½ minutes.
Barrel size: Barrels are 22" x 28".

FLOW:

A. Loading-Unloading station. Media chips are loaded into barrel by air-operated swivel chute attached to overhead storage hopper. Parts are then placed in barrel and it is ejected from station.

B. Barrels pass along power-and-free conveyor system to start of automated finishing lines.

C. Barrels alternately enter overhead walking beams over lines 1 and 2; each indexes automatically every 5 minutes.

D. First station. Degreasing tank.

E-F-G. Grinding tanks.

H. Rinse tank.

I. Rust inhibiting tank.

J. Parts and media are unloaded to belt conveyor.

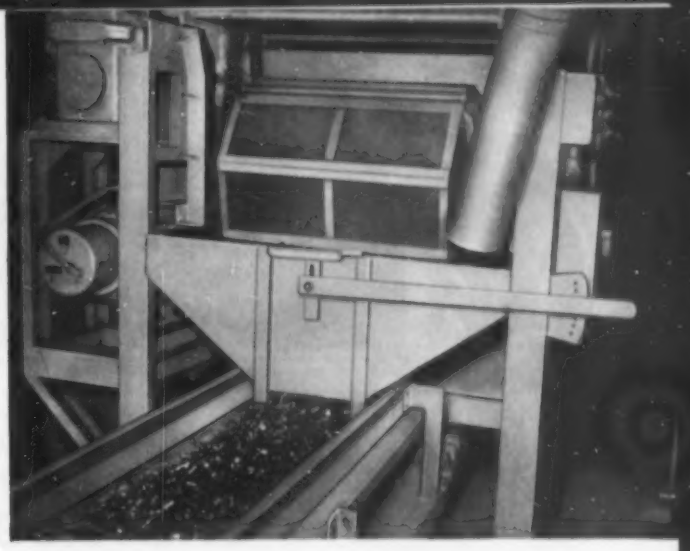
K. Parts are separated from media by magnetic pulley.

L. Pulley raises parts from conveyor where parts are "picked-off" by operators for assembly or storage.

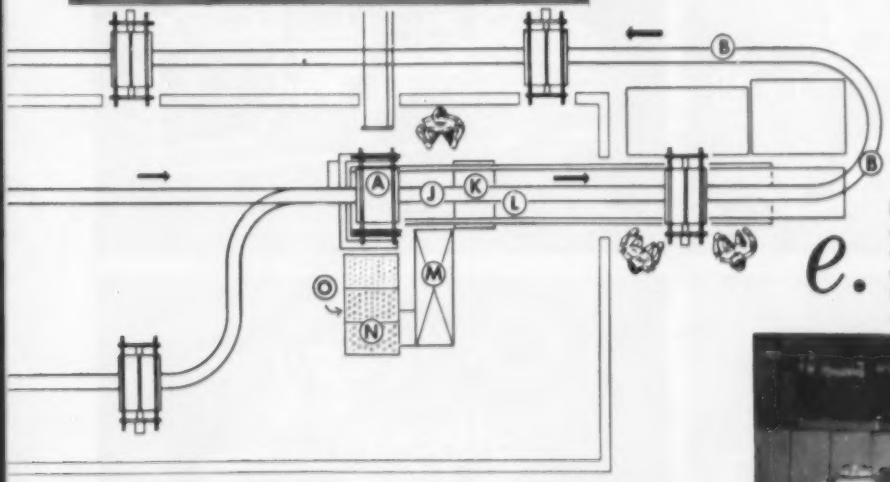
M. Vertical boot-type elevator. Elevates chips to overhead rotary screen classifier.

N. Rotary screen classifier. Separates media chips according to size.

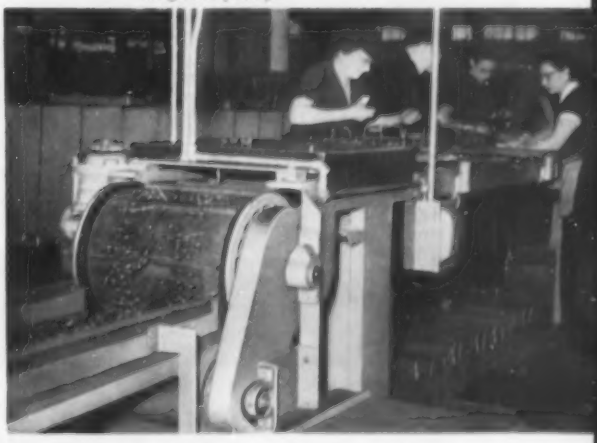
O. Overhead hopper. Media chips drop through classifier into separate retaining bins.



d. Every 2½ minutes in this Almco Sub-O-Matic System, a barrel of completely processed parts is unloaded. This high rate of production is actually equivalent to one *man operating 92 standard barrels!*



e. Here, a magnetic pulley separates centerless ground steel parts from the abrasive chips. Parts pass over a demagnetizing coil and are conveyed to a "pick-off" table where operators remove them for assembly. For non-ferrous parts, a vibrating screen replaces the magnetic pulley.



f. While parts journey to "pick-off" table, the abrasive chips drop from the conveyor belt into a vertical bucket elevator which lifts them to an overhead rotary screen classifier. Chips are separated according to size and are then dropped into respective bins, ready for the next loading.

In pioneering automated barrel finishing, Almco engineers have developed two basic types of Sub-O-Matic Systems, the Skip-Station and the In-Line. Many variations are possible, so that Almco engineers can match your requirements exactly. The completely equipped Laboratory at Albert Lea, Minnesota, displays operating systems for examination, and sample processing of your parts. Write today for your copy of the new Almco Sub-O-Matic Catalog!

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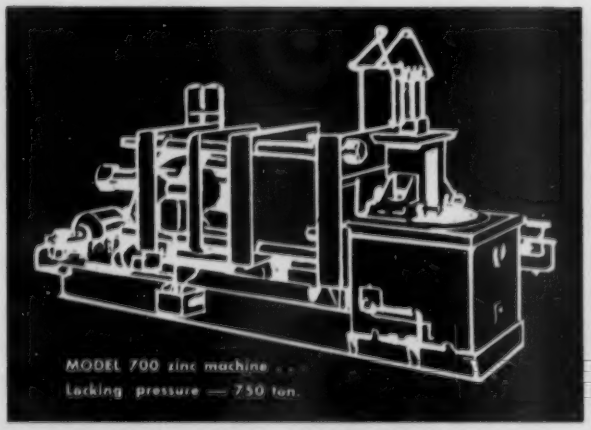
B&T DIE CASTING MACHINES

9 PROVEN MODELS

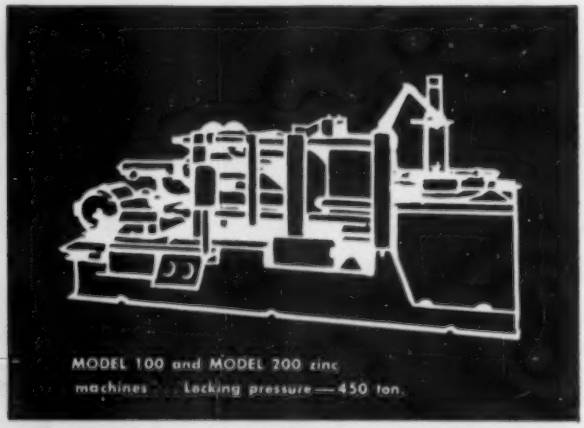
RANGING IN CAPACITY FROM 100 to 750 TONS — FOR ZINC, ALUMINUM, MAGNESIUM and BRASS

DESIGNED AND BUILT TO THE SPECIFICATIONS OF PRACTICAL, LONG-TIME DIECASTERS AND DEVELOPERS OF . . .

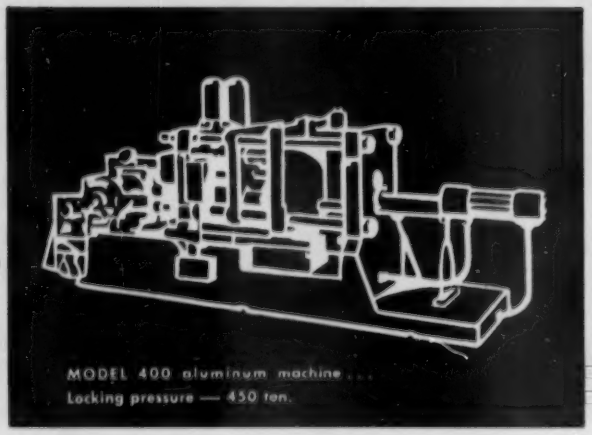
DIE CASTING MACHINES



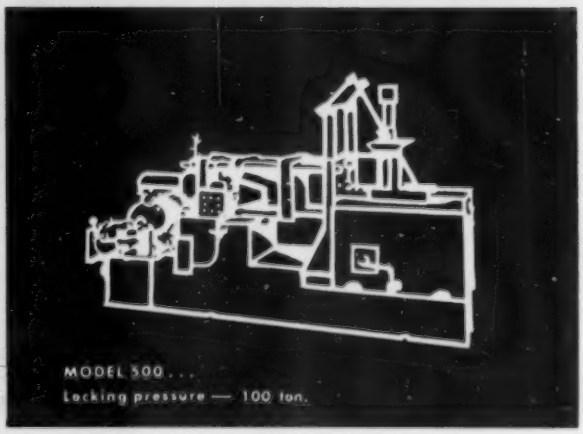
MODEL 700 zinc machine . . .
Locking pressure — 750 ton.



MODEL 100 and MODEL 200 zinc machines . . . Locking pressure — 450 ton.



MODEL 400 aluminum machine . . .
Locking pressure — 450 ton.



MODEL 500 . . .
Locking pressure — 100 ton.

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B&T die casting machines operate with four extra heavy alloy steel casting toggles that lock directly under the tie bars. The hydraulic lines are of extra heavy seamless pipe; Weldon joints, flanged connections and "O" ring seals on pressure lines. Full specifications on all models furnished upon request. Consult with us on your requirements.

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USEFUL LITERATURE, CATALOGS, MANUALS

any of these technical publications may be obtained by circling the appropriate numbers on the Reader Service Cards, Pages 16-17

PROCESSES

Investment Castings: 154
Liebros Casting Co., Inc.—4 pg. file folder. A folder describes and illustrates some of the many investment castings that have been made and giving a brief description of the advantages of this production method.

Zinc Die Castings: 155
The New Jersey Zinc Co.—Vol. 24, No. 1 of The Alloy Pot. An external house organ of the company devoted to the promotion of the use of zinc. All of the parts illustrated and discussed in this issue are die castings.

Investment Casting Book: 156
Haynes Stellite Co.—40 pg. illustrated book. A description of the process, illustrations of a few of the many castings that have been produced and tables giving the chemistry and properties (as-cast) of many alloys this company casts.

MATERIALS AND EQUIPMENT

Heat Exchangers: 159
Yates-American Machine Co.—4 pg. illustrated folder. The basic dimensions for a number of different styles of heat exchangers are listed. The illustrations show typical construction.

Oil & Chip Handling: 160
Coolant Equipment Corp.—4 pg. illustrated folder. Coolant dispensers and/or mixers, both hand and power operated are illustrated and described. Two styles of chip trucks are also described and illustrated.

Heat Resistant Castings: 161
Empire Steel Castings, Inc.—bulletin 156-H on stainless castings. This bulletin is in the form of a chart correlating ACI designations with AISI type numbers and ASTM designations for heat resistant stainless steel castings. The principal alloying elements and typical mechanical properties of seven different steels are also given. Included are high-temperature properties and creep stress data.

Ejector Pin Data: 162
Detroit Mold Engineering Co.—4 pg. DME News. The latest issue of this external house organ deals with ejector pins exclusively. Design, heat-treatment, installation, etc. are covered. An insert data sheet gives standard draft angles for cored holes up to 1" deep with angles from ½° to 30° per side.

Investment Cast Alloy: 163
WalMet Alloy Co.—Stock sheet and Metal Briefs. The May issue of "Metals in Brief" has notes on strategic stockpiling, titanium, soldering aluminum, etc. Also available is the May stock sheet listing steels available and the form (bar, shot, ingot).

Platen Presses: 164
Rodgers Hydraulic, Inc.—4 pg. brochure, illustrated. A description of platen press applications in metal drawing, metal forming, plastic and ceramic molding and other metal and non-metal forming operations.

Cutting & Scarfing: 165
Hoeganaes Sponge Iron Corp.—4 pg. brochure. The applications of iron powder to cutting, scarfing, washing and lancing are given. Some technical data on Ancor-Flame iron powder are given.

Plug Gauges: 166
Pratt & Whitney Co.—4 pg. brochure. A new line of reversible plug gauges are described that are said to give twice the wear life of other types since the gauging members are reversible in the gauge handle.

Spectrographic Analysis: 167
Jarrell-Ash Co.—8 pg. catalog, illustrated. A description of a high precision grating instrument for routine analytical laboratory use. Included is a description of the full line of accessories needed.

Molybdenum Disulfide Lubricants: 168
The Lockrey Co.—2 pg. preliminary data sheet. A description of a new, highly stabilized colloidal MoS_2 EP lubricant. The new dispersion is said to contain a stabilizing agent to prevent acid formation due to oxidation.

Torque Manual: 169
P. A. Sturtevant Co.—28 pg. technical manual. This is the second, revised edition of the well known manual on the general principles of torque tools and methods of their use. Basic information on torque is included.

Refractories: 170
The Carborundum Co.—external house organ. A new external house organ to give general information on refractories and to show both well known and new applications of refractory materials.

Foundry Core Paste: 171
Frederic B. Stevens, Inc.—Technical bulletin FP-105. A report on an improved version of Fastick Liquid Core Paste for foundry use. All of the properties and necessary technical data for use of the paste are included.

CO_2 Core Hardening: 172
National Cylinder Gas Co.—16 pg. booklet. A discussion of the uses of carbon dioxide gas for hardening cores and molds. The booklet discusses advantages, problems and their solutions, methods and materials, etc.

Low Melting Point Alloys: 173
Cerro de Pasco Corp.—4 pg. bulletin. A listing of the many different uses of low melting point alloys and the particular alloy recommended for each purpose. Four major divisions are listed—Design, pattern reproduction, punch and die anchorage and holding material for irregular and thin parts.

Welding Steel Castings: 174
Tempil Corp.—38 pg. book. Recommended Practice for the Welding of Steel Castings—a book for the fabricator and steel foundryman who does welding.

Investment Binders: 175
Monsrose Chemical Co.—18 pg. technical report. The role of ethyl silicate binders in the investment casting industry is thoroughly covered. Information in investment preparation and use as well as several pages of common foundry troubles and their cure are given.

Beryllium Copper Alloys: 176
The Beryllium Corp.—12 page catalog. The complete range of this company's beryllium-copper alloys is given together with valuable reference data for engineers and designers who specify and make castings.

High Vacuum Pumps: 177
Kinney Mfg. Div., The New York Air Brake Co.—4 pg. bulletin No. 403. A description of six models of small, air-cooled compound high vacuum pumps. Sizes range from 2.0 to 46.0 cu. ft. displacement per min. The blank off pressure for all pumps is below 0.2 microns.

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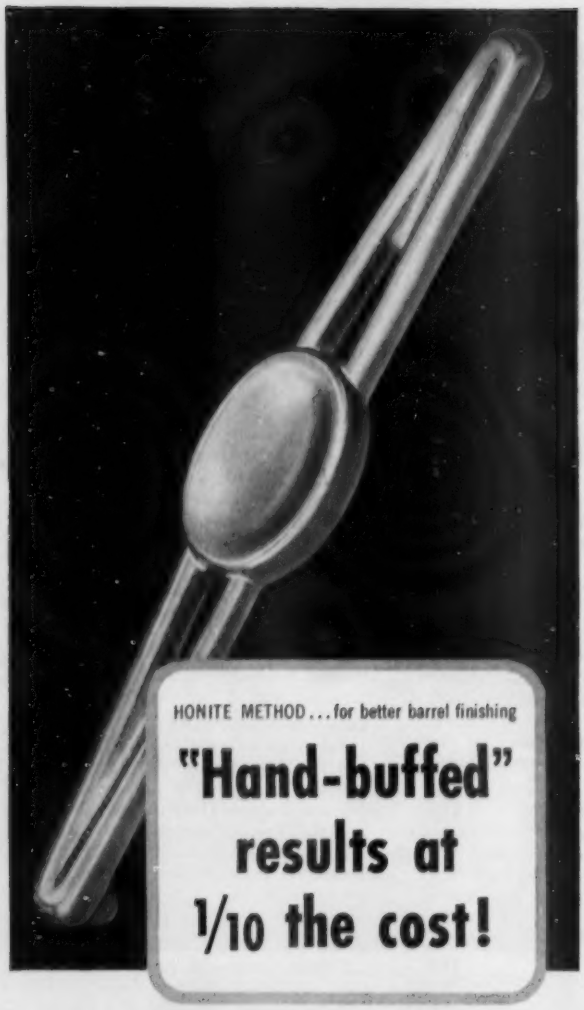

This die-cast aluminum handle for furniture is one of several thousand processed each month by a Cincinnati, Ohio manufacturer. The handles must be given a super-smooth finish prior to plating—a job formerly done by rough finishing with a competitive barrel finishing abrasive, then *hand* buffing to produce the desired finish. The hand buffing cost was prohibitively high.

Recently, this company switched to the HONITE Barrel Finishing Method, using a 2-step process—cutting with Regular HONITE Chips and HONITE Micro-Cut Compound, then polishing with HONITE Multi-Burnish Compound.

This method produces the same quality finish as hand-buffing, at 90% lower cost!

You, too, can cut costs with the HONITE Barrel Finishing Method. Call your nearby HONITE Sales Engineer today. Or write for free booklet: "Facts and Figures Report on Honite Barrel Finishing". Address: Minnesota Mining and Manufacturing Co., Dept. FF-76, St. Paul 6, Minn.

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USEFUL LITERATURE

continued from page 61

Salt Pumps: 178
Ajax Electric Co.—4 pg. bulletin No. 800. A description of an air driven molten salt pump. The pump is adaptable to both molten salt and low melting point metals such as aluminum and magnesium.

Snap-Action Switches: 179
Micro-Switch Div. Minneapolis-Honeywell Regulator Co.—16 pg. booklet. A compilation of some of the best ideas for application of snap-action switches. "Micro-Tips Digest" contains 43 illustrated descriptions of different applications.

Zirconium Oxide: 180
Zirconium Corp. of America—4 brochures. A group of brochures that describe and give the properties of stabilized zirconia for use as a refractory, abrasive, electrical insulator, etc. Some interest has recently been shown in zirconium oxide as an investment mold material.

FINISHING

Toolholder: 184
Vascoloy-Ramet Corp.—24 pg. catalog No. VR-437. A description of the complete line of tool holders and carbide inserts made by this company. Both positive and negative rake tool holders utilizing throw-away inserts and negative rake tool holders using standard inserts are covered.

Abrasive Discs: 185
Gardner Machine Co.—15 pg. external house organ for May. The Gardner Grinder illustrates and describes some of the many grinding discs made by the company.

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Electrical-Drilling	25E7A	40E12A
Drilling-Tapping	25ED7A	40ED12A
Drilling-Dwell	25EB7A	40EB12A

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Barrel Finish Compound: **186**
Oakite Products Co.—illustrated brochure. A description of a new barrel finishing compound for small parts deburring. The new material is described as a fast-cutting abrasive with surface active agents designed to keep media sharp and bright.

Multiple Head Drilling & Tapping: **187**
Ettco Tool Co., Inc.—illustrated bulletin No. 600A. A complete description of a new multiple spindle drilling and tapping head designed especially for working anywhere within a 3" x 13-15/16" rectangular area.

Maintenance Painting: **188**
The DeVilbiss Co.—maintenance guide book and catalog. A combined catalog of equipment and supplies and a guide book giving charts that show the proper equipment and methods to be used for plant maintenance painting.

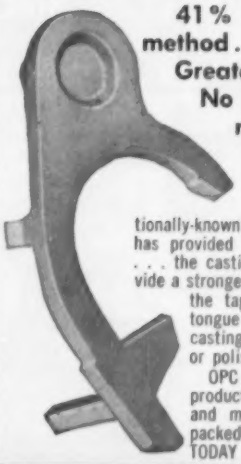
Barrel Finishing Materials: **189**
Esbec Barrel Finishing Corp.—2 pg. folder. A listing covering the specifications and applications of fourteen different color-coded compounds and abrasives for barrel finishing.

Plating Anodes: **190**
Univertical Foundry & Machine Co.—1 pg. descriptive leaflet. A statement of the advantages to be gained by the direct purchase of electro-plating anodes from the converter. A listing of the many different anode materials, in addition to nickel, that are available is included.

Water Demineralization: **191**
Graver Water Conditioning Co.—24 pg. article. A technical discussion of the advantages and methods for the demineralization of water. Different types of ion-exchange beds are discussed. A bibliography of 119 items is included.

Continued on next page

CAN YOU SAY THIS ABOUT YOUR SMALL PARTS?



41% savings over former method . . . Increased strength . . . Greater accuracy . . . No machining or polishing required of bearing surface

This small lock arm, produced by OPC for Diebold, Inc., nationally-known manufacturers of safes and locks, has provided "41% savings from original part . . . the casting and subsequent machining provide a stronger part . . . much more accurate . . . the tapered surface on the end of the tongue must act as a bearing surface; castings as received require no machining or polishing of this surface."

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This list of cleaning (and related) jobs was made up with the advice of several of our customers in aircraft production. It shows, in order of volume, the jobs on which Oakite has most frequently been able to save them time and money. Here it is:

1 **Cleaning aluminum, steel and magnesium**
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4 **Deoxidizing aluminum**
5 **Steam cleaning aluminum and steel**
6 **Deflocculating paint in spray booths**
7 **Preparing metal for painting**
8 **Removing scale and corrosion**
9 **Preventing corrosion**

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COMPANY _____

ADDRESS _____

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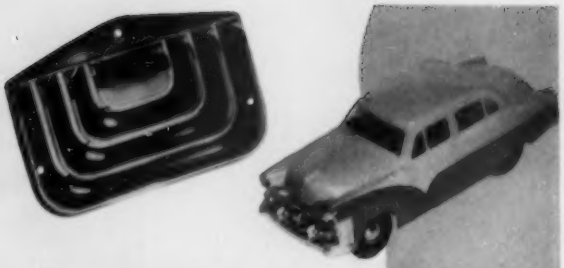

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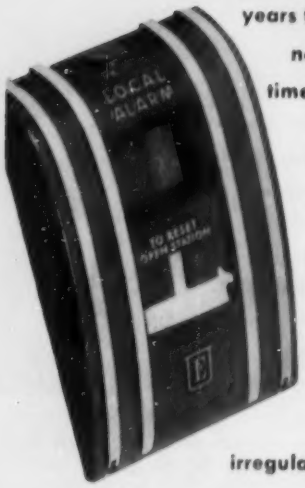

IF { your product is judged on appearance
you want best possible results
you want a minimum of rejections
CONSULT US

Send for your FREE copy of our 20-page book which shows the different types of masks and gives case-study illustrations of their use. Or send your samples and drawings for consultation and estimates.

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USEFUL LITERATURE

continued from page 63

Snagging Grinders: 192

The Standard Electrical Tool Co., 6 pg. folder. An illustrated description of the several different types and models of snagging grinders. A chart giving specifications for the various models is included.

"How-To" Book on Thermocouples: 193

Wheelco Instrument Div., Barber-Colman Co., 40 page booklet. Thermocouple Data Book discusses construction and use of thermocouples and radiation detectors. Includes information on "How to Check Thermocouples," "How to Make Thermocouples," "How to Select and Size Thermocouples," as well as technical reference material.

Resin-Coated Sand: 194

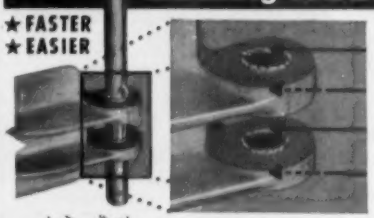
Durez Plastics Div., Hooker Electrochemical Co., 16 page booklet, illustrated. Comprehensive guide to using resin-coated sand for shell molds is a companion treatise to the company's "Durez Guide to Shell Molding" recently published. Contains detailed procedures and recommendations.

Masking Tape: 195

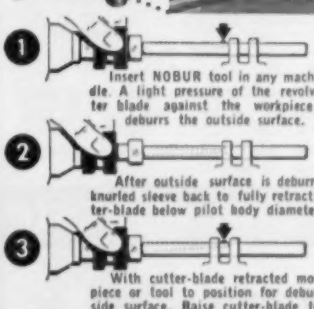
Permacel Tape Corp., Brochure. All-purpose masking tapes are described, including three main types: crepe-backed tape for use where maximum stretch is required, flexible flatback tape where moderate stretch is required, and strong flatback tape for extra strength. Paint masking performance is fully reported.

HOW TO.... DEBURR THESE INACCESSIBLE HOLE FACES BY MACHINE OPERATION with the amazing NOBUR TOOL

★ FASTER
★ EASIER



No more hand finishing methods for those hard-to-get-at inner surfaces on multi-wall parts. The NOBUR Tool with its double edge cutting blade does the job in seconds . . . all by **machine operation.** Can be used by anyone, with complete safety, on your own lathe, drill press, etc. Simple to operate.



1. Insert NOBUR tool in any machine spindle. A light pressure of the revolving cutter blade against the workpiece quickly deburrs the outside surface.
2. After outside surface is deburred, slide knurled sleeve back to fully retract the cutter-blade below pilot body diameter.
3. With cutter-blade retracted move workpiece or tool to position for deburring inside surface. Raise cutter-blade to deburr first one surface then the other.

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HEAT CONTROL

continued from page 48

ten alloy, machine parts and the die and how heat accumulates in or is dissipated from the die during normal working.

Heat Transfer To A Die

With any hot-chamber type pressure die casting machine, heat is regularly transferred to the die in several ways, which are usually, though not necessarily, complementary to each other. The scale, manner and rapidity of heat transfer are of the greatest practical importance when determining (a) the optimum mean die-temperature for most efficient working; (b) the equalized distribution of heat throughout the die and best thermal balance in that tool; (c) the precise kind of heat-control to be employed in the die, or over other working conditions to maintain features (a) and (b).

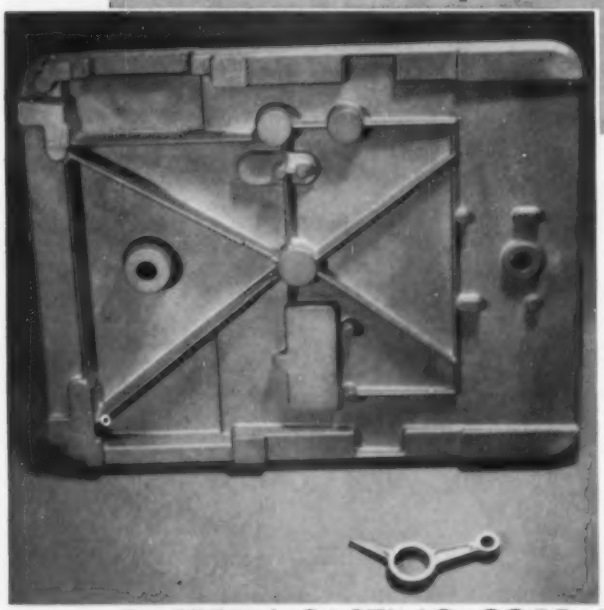
Heat is also being constantly extracted from an operating die in certain, often unavoidable, ways: by normal radiation to the surrounding cooler air, by conductance to the more massive portions of the machine in close contact with the die, etc. The influence of these and other recurrent heat-losses have also to be carefully considered and afforded adequate compensation.

Heat is transmitted to or dissipated from a working die chiefly in the following ways.

1. There is an *indirect but continuous* transfer of some heat from the machine metal-pot containing the large volume of molten alloy. This flows first to the massive platens on which the die is affixed, or to some immediately adjacent heavy portions of the machine-frame, and thence into the die itself.
2. Heat is also indirectly transferred to the platens and contiguous frame portions, and ultimately to the die, from the furnace-burners underneath and around the metal-pot.

These two forms of heat input take place continuously irrespective of whether the machine is operating to inject repeated charges of molten alloy direct into the die. As a result of such heat-transfers, the die gradually becomes hotter than the warm air surrounding the tool and machine. Unless it is accompanied by regular injection of alloy charges,

aluminum . . .
▶ permanent mold castings
▶ die castings



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The abbot and the Bishop's Candlesticks

The Bishop was upset. How could he possibly have 500 dull, tarnished brass candlesticks polished and gleaming in time for tomorrow's special candlelight services?

The *abbot* was quite calm. He *knew* the answer to the Bishop's dilemma and in less than twenty-four hours, he returned from his laboratory with the candlesticks – bright and glistening.

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Articles made of brass and other metals may be readily burnished and tumbled with Abbott Burnishing Materials. Made in six scientifically designed shapes, Abbott Burnishing Materials make efficient and uniform contact on metal parts and castings of every conceivable size and shape. Economical to use, they are *deep hardened* and have a mirrorlike glass-hard surface for extra long life. Combined with the Abbott Vertical Tumbling Barrel, they make the perfect barrel finishing combination.

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however, die temperature cannot rise very much higher than that of the air around it.

Before injection commences, a stage will in fact be reached, where the heat flows *out* of the die to ambient air at approximately the same rate as the heat passing *into* the die by conductance from the hotter platens. Thus a stable temperature level is attained, but this will not be sufficiently high to permit satisfactory die casting.

3. When the machine is put into operation, the injection of each charge of molten alloy will *directly* increase die temperature in a rapid and considerable manner. The rate at which this direct heating occurs depends upon the temperature of the alloy, the volume of such charge compared to that of the die, and the rapidity of the injection cycles.

4. During intervals between shots some of the accrued heat in the die will be dissipated into the air by radiation, or to the platens by conductance, since the latter elements will then be much cooler than the less massive die.

At the outset of injection operations, the rate at which heat is lost in the above fashion in-between shots is never very considerable so that most of the *direct* heat delivered by the hot alloy charges is retained in the die.

5. As injection operations progress in regular sequence, each cycle results in an increase in the mean temperature of the die. A stage is eventually reached where the total losses to the surrounding air and platens become high enough to balance heat input resulting from injection of hot alloy. Thus a more or less stable die is attained for any *constant rate of injection* and alloy temperature. This is the optimum working temperature at which best operating results are to be obtained.

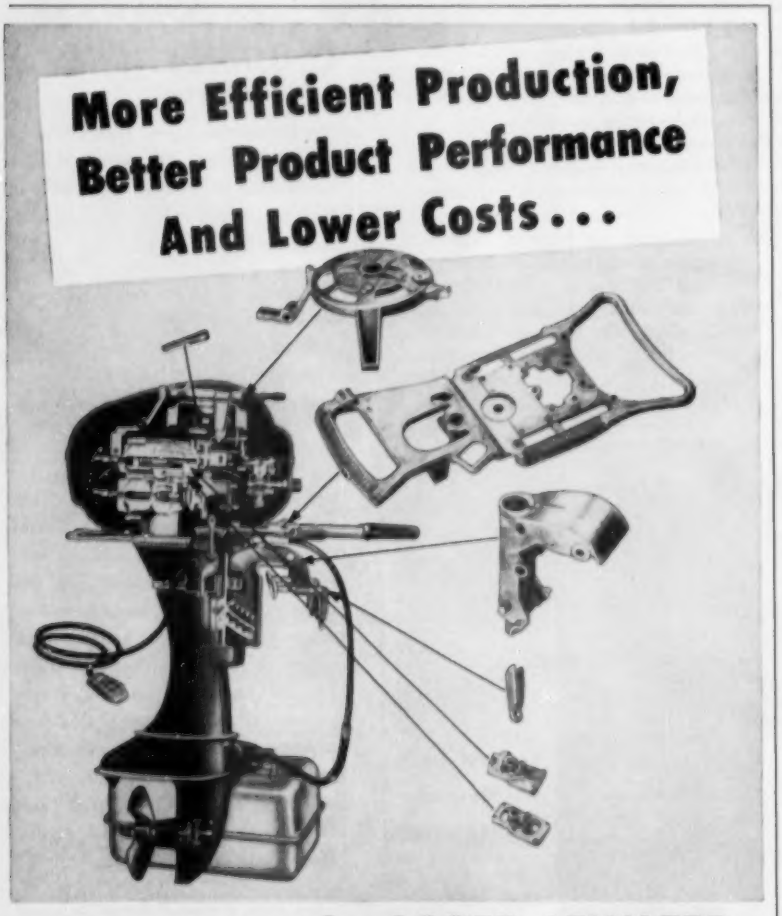
Any increase in die-heat, from whatever source, above this optimum temperature level results in a corresponding increase in the rate of heat-loss to the surrounding air and to the platens. The latter elements will then be very much cooler than the operating die, thus heat will flow from die to platens.

Stability of die temperature at optimum level is not restricted to a *single temperature* value, but takes the form of a more or less uniform scale of fluctuations between *two specific temperatures*. If heat variations in the die are maintained consistently within such limiting temperatures, and the die is similarly held in correct thermal balance over all critical working portions, stable head conditions are created to give satisfactory die casting.

6. From the foregoing considerations, it will be appreciated that, if only a *small volume* of molten alloy is injected into the die per shot, and injection strokes occur with great frequency, fluctuations in die temperature will be correspondingly small. With these operating conditions it is often comparatively easy to maintain die heat at the proper optimum level.

Contrariwise, if a large volume of alloy is injected into the die at each shot, and the latter occur at a much slower frequency, fluctuations in die temperature must be markedly greater than in the previous case. This condition will

Continued on page 72



are reasons why SCOTT-ATWATER uses ACCURATE die castings

■ Because of their uniformity and light weight, ACCURATE die castings greatly reduced the time required for handling and assembly. Cast to close tolerances, they reduced or eliminated machining operations, special tooling and scrap loss. In addition, a more dependable and efficient motor was produced with die castings that have high strength-light weight properties and are non-porous and leakproof. Perhaps you too, can improve your product and profit picture with ACCURATE die castings. Write, wire or phone if you have a parts problem demanding immediate attention.

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For more information circle No. 2 on the Reader Service Card

(Advertisement)

Special Reports On Finishing Non-Ferrous Metals

NUMBER II—Paint Base, Corrosion-Resistant Finishing with Iridite

WHAT IS IRIDITE®?

Briefly, Iridite is the tradename for a specialized line of chromate conversion finishes. They are generally applied by dip, some by brush or spray, at or near room temperature, with automatic equipment or manual finishing facilities. During application, a chemical reaction occurs that produces a thin (.00002" max.) gel-like, complex chromate film of a non-porous nature on the surface of the metal. This film is an integral part of the metal itself, thus cannot flake, chip or peel. No special equipment, exhaust systems or specially trained personnel are required.

Chromate conversion coatings are well known and accepted throughout industry as an economical means of providing corrosion protection, a good paint base and decorative finishes for non-ferrous metals. However, continued developments have been so rapid and widespread that many manufacturers may not be completely aware of the breadth of application of this type of finish. Hence, this digest of current information; to bring you up to date on the many ways in which you can obtain proper surface preparation for painting and increase product durability with a single multi-purpose chemical pretreatment. Report I on decorative, corrosion-resistant finishes and Report III on chemically polished, corrosion-resistant finishes are available on request.

First, it is an accepted fact that metal surfaces should be prepared before painting to make possible an efficient paint system. Naturally, this preparation should provide for good initial paint adhesion. Chemical treatments have proved extremely effective in this respect, particularly those of a neutral or preferably acid nature. Further, to be most efficient, chemical treatments should provide a non-porous barrier to maintain adhesion by sealing the metal from the paint and moisture. They should also provide a self-healing film which prevents lateral corrosion in the event that bare metal is exposed through scratching.

The Iridite chromate conversion coatings meet all these requirements. Iridite is a chemical conversion treatment for surface preparation. It provides initial paint bonding by molecular adhesion. It is acid in nature and produces a film that is gel-like and non-porous in structure. Thus, the Iridite film effectively seals the metal from the paint and from moisture penetration. Because the film contains certain relatively soluble constituents, it will protect areas scratched through to bare metal and prevent lateral corrosion. This is accomplished by a gradual leaching of these constituents into the damaged area.

Further, because of its gel-like, non-crystalline nature, the Iridite film will not affect the appearance or texture of the paint film, nor will it dust or powder to mar the painted surface. Because the film is non-porous, paint coverage is increased, thus substantial savings in paint costs will be realized. In addition, treated parts may be stored for long periods of time prior to painting without the risk of entrapped moisture causing blistering when painting.

Iridite chromate conversion coatings are widely used with equal ease and success under both baked and air-dried paint systems. While the actual adherence properties of the Iridite film do not increase appreciably with its thickness, corrosion protection does. The protection of the Iridite film is proportionate to its thickness and should be taken into consideration when selecting the Iridite to meet your needs. However, it is sometimes necessary to sacrifice maximum corrosion protection for appearance when a finished part is to be only partially painted. For example, it may be desirable to use a thin, clear, bright Iridite film if the unpainted areas must present a chrome-like appearance. A typical case is that of instrument housings on which the exterior is painted and the inside left unpainted.

On the other hand, if all surfaces of the product are to be painted and maximum corrosion protection is required, the heavier and most protective Iridite films should be used. For example, all surfaces of zinc die cast fruit juicers are finished with a highly protective Iridite film prior to painting to provide maximum resistance to the corrosive action of fruit juices.

Iridite finishes are now available for all commercial forms of the more commonly used non-ferrous metals, including zinc, cadmium, aluminum, magnesium, silver, copper, brass and bronze. In addition to providing an excellent base for paint, the Iridite films also have high decorative value when used as final finishes in themselves.

These films can produce a wide variety of pleasing appearances including clear bright, iridescent yellow, bronze, olive drab and brown. In addition, many films can be modified by bleaching or by dyeing. Among the dye colors available are various shades of red, yellow, green, blue or black.

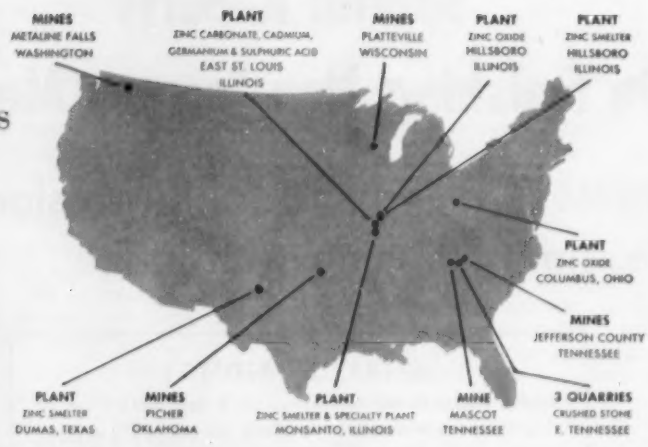
In planning or designing, you should consider the many other characteristics of Iridite finishes which may enter into the specific problem. In addition to their functions as protective and decorative finishes, and as bases for organic finishes and bonding compounds, Iridites have low electrical resistance. Some can be soldered and welded. The film does not affect the dimensional stability of close tolerance parts.

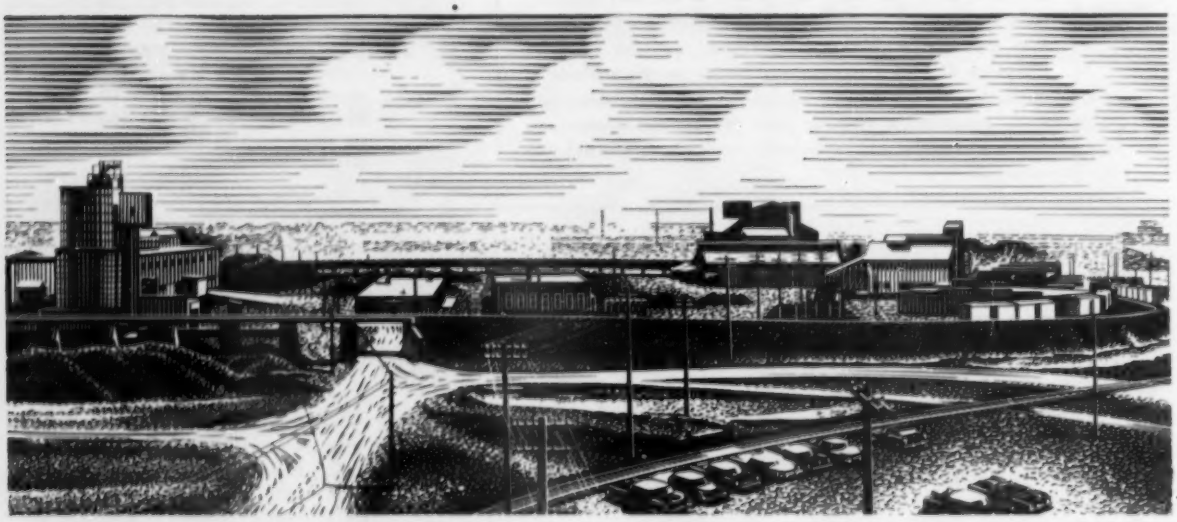
Iridites are widely approved under both Armed Services and industrial specifications because of performance, low cost and savings of materials and equipment.

You can see then, that with the many factors to be considered, selection of the Iridite best suited to your product requires the services of a specialist. That's why Allied maintains a staff of competent Field Engineers—to help you select the Iridite to make your installation most efficient in improving the quality of your product. You'll find your Allied Field Engineer listed under "Plating Supplies" in your classified telephone book. Or, write direct and tell us your problem. Complete literature and data, as well as sample part processing, is available. Allied Research Products, Inc., 4004-06 East Monument Street, Baltimore 5, Maryland.

For more information circle No. 59 on the Reader Service Card

American Zinc and its products from A to Z





ZINC OXIDE OPERATIONS AT COLUMBUS, OHIO

Roasting operation: Zinc oxide manufacturing facilities producing lead-free zinc oxides for rubber, paint, ceramic, textile and chemical industries. Research and customer service laboratories are located here. For complete picture of American Zinc operations, see map above.

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SULPHURIC ACID
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For more information circle No. 7 on the Reader Service Card

NEW PRODUCTS AND DEVELOPMENTS

Want complete details on these announcements? Use the Reader Service Cards. You'll find them facing page 16 of this issue

ENGRAVING MACHINE FOR DIE AND MOLD WORK

Designed for the rapid reproduction of engraved panels, name plates and the like, a new engraving machine is especially useful for die engraving work and similar operations.

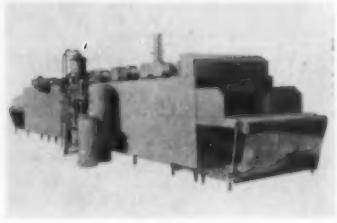
The machine, of French design and manufacture, operates on the pantograph principle with one arm carrying the copying stylus and the other the engraving tool. The engraving tool is motor driven with the spindle mounted in a resilient coupling. Motor speed can be varied from 1000 to 1200 rpm through a built in regulator.

Any type of cutter between 3 mm and 8 mm diameter (0.118 to 0.315") can be used. The cutter spindle is said to be designed so that runout can be held to less than 0.0008.

Reduction ratios from 1:2 to 1:6 are obtainable, giving 23 different sizes from a single guide. The machine will accommodate 5.3" height under the pantograph and this can be increased to 16.14" with a special vertical column.

Scripta
For more information, circle No. 209 on the Reader Service Card

AUTOMATIC WATER WASHER FOR SPOT-FREE WASHING



An automatic water washer for spotless cleaning of metal parts or products has been developed and put on the market. No residual matter or water marks are left on the metal by this machine, which runs virtually unattended.

The purity of surface is obtained by a series of cleaning stages, which include rinsing with deionized water that is virtually the equivalent of triple distilled water, according to the manufacturer.

Parts to be cleaned are washed in an alkaline base detergent or acid to remove any accumulation of grease, dirt, grit or dust. This is followed by water rinses and a drying cycle. The washer is so designed that all water solutions and rinse water can be re-used.

The washers are built for straight line operation and can be incorporated into any production line. Units are designed for each purchaser so as to fit both the job and space requirements.

Stoelting Brothers Co.
For more information, circle No. 206 on the Reader Service Card

HIGH TEMPERATURE FURNACE FOR LAB OR LIMITED PRODUCTION

A new 4 KW furnace accommodating one combustion tube up to 5" OD and capable of working at temperatures up to 2750 F has been announced.

The new unit is heated by 8 silicon carbide electric resistance heaters having an effective heating length of 8".

The large size tube allows the furnace to be used for production runs of small parts and can be equipped with a water jacketed Inconel tube assembly for heat treating applications up to 2150 F. A protective atmosphere can easily be used for such applications as sintering, bright annealing, brazing, bright hardening of high chromium steels, reducing metal powders, furnace soldering, nitriding, etc.

Installation of special plugs permits the use of the furnace as an optical pyrometer calibrating device.

Lindberg Engineering Co.
For more information, circle No. 207 on the Reader Service Card

ULTRASONIC TRANSDUCER . . . for cleaning, plating

Announcement has been made of a new ultra-sonic transducer for cleaning, degreasing, pickling, plating and other physical and chemical processes. The unit is completely sealed, metal jacketed, stainless steel lined and thermostatically protected.

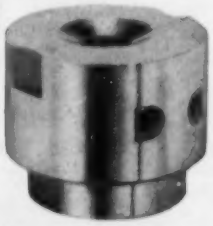
Its stainless steel treatment chamber permits use of a wide variety of process liquids. Provision is made for draining and re-circulating process liquids during operation. The treatment chamber is 20" x 8" x 6" deep with a capacity of 2½ gallons.

The transducer has a resonant frequency of 20 Kc/sec. which provides maximum cavitation energy above the range of human audible perception. It is powered by an ultrasonic generator which is continually variable in frequency from 10 Kc to 1200 Kc and has an output of 4000 watts.

General Ultrasonics Co.
For more information, circle No. 208 on the Reader Service Card

NOW ESPECIALLY DESIGNED FOR ADDED SAVINGS TO DIE CASTERS!

D-M-E STANDARD Water-Cooled SPRUE BUSHING



- *Nitrided for Longer Wear*
- *Large Capacity Cooling Jacket*
- *Ground, Nitrided and Polished Seat*
- *Available From Stock*
- *Priced at $25.00 Each*

D-M-E STANDARD Water-Cooled SPRUE SPREADERS

- *Nitrided for Longer Wear*
- *Straight or Tapered Body*
- *Uniform Center Cooling for Fast Cycles*
- *High Quality Air-Hardening Steel*
- *Available From Stock*
- *Priced at $16.00 Each*

D-M-E STANDARD TAPERED CUTTER for Sprue Spreaders

- *Solid Carbide Cutting Edges — Rigid One-Piece Design*
- *Specially Designed for Standard Sprue Spreaders*
- *Available From Stock*

- *Priced at $28.00 Each*

Call or write TODAY . . . For Complete Specification Sheet!

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CLEVELAND 9, O. - D-M-E CORP. 502 BROOKPARK RD., SHADYSIDE 1-0202
LOS ANGELES 7, CAL. 3700 SOUTH MAIN STREET, ADAMS 3-8214

For more information circle No. 22 on the Reader Service Card

MONO-RAIL BLAST CLEANER . . . For parts with internal cavities

Intended for the cleaning of parts having open internal cavities, a new monorail mounted blast cleaner has been announced. The machine is intended primarily for cleaning problems involving open cavaties that are difficult to clean completely. A typical application is the cleaning of cast automotive engine blocks.

The new machine, an airless abrasive blast cleaner, differs from older and conventional designs in that more efficient use is made of the blast cleaning abrasive. This results in less abrasive use. Fewer centrifugal abrasive hurling units are required, so power costs are reduced. The total result is lower cleaning cost.

The improved design of this unit places the work to be cleaned in such a position that cavities are exposed to the abrasive shower from a single hurling wheel during the entire period the piece is in blasting position.

Among other new features are double chain drives to increase rigidity of work-holdng hooks on the conveyor, reducing swaying of the work when it encounters the force of the blast.

Wheelabrator Corp.
For more information, circle No. 205 on the Reader Service Card

PARTS WASHING MACHINE . . . has double action

A new line of parts washing machines which combine the chemical action of the cleaner with mechanical action has been introduced.

Utilizing a rapid up and down motion of the submerged work to provide mechanical washing action and to present fresh cleaner solution to soiled areas, the new cleaner is reported to give superior action to any other type of agitation cleaning now available.

The units are built for heavy industrial work and have had the number of moving parts reduced to a minimum so that wear is cut down. All drive parts are removed from the fluid or travel of the work, the linkage is simple and no obstructions hamper the operator.

The washers are available to handle from 50 to 2500 lbs. per load. They are either non-heated or heated by steam, gas or electricity. Units can be combined to work in sequence operations.

American Machine & Solvents Co., Inc.
For more information, circle No. 210 on the Reader Service Card

SURFACE THERMOMETER
. . . has fast, accurate response

A new spot check surface thermometer for industrial applications has recently been announced. The instrument is made entirely of stainless steel and has a range of from 50 to 1000 F. The instrument is only 1¾" in diameter and weighs 1/3 oz. It can be used to check the temperature of any flat surface such as dies, hot plates, large steam pipes, billets, etc. An accurate temperature reading takes 60 seconds.

The thermometer is accurately calibrated to within 2 percent and the zero point can be set at any time by the user. Other uses of the instrument are in checking the ambient temperatures in furnaces, ovens and other enclosed spaces as well as in non-corrosive liquids and gases up to 1000 F.

Pacific Transducer Corp.
For more information, circle No. 211 on the Reader Service Card

RUST PREVENTATIVE
. . . applied in aerosol spray

A new rust preventive, known as "Rust Chek" is now being marketed in a 12 ounce aerosol spray container. A single can provides about 80 sq. ft. of coverage in the form of a clear, dry, waxy film about 0.0005 thick. Except in cases where critical tolerances are held, the film need not be removed when the article coated is put into service. The film is worked off in the using, and in some applications, such as on power saws, it serves as a lubricant.

In tool, mold and similar applications the manufacturer claims the new preventive has the advantage over grease or oil in that it does not absorb dust or dirt.

Eastern Aerosol Products
For more information, circle No. 212 on the Reader Service Card

COLD CHEMICAL COATING
. . . developed for aluminum

A new cold chemical has been perfected for producing a uniform black finish on aluminum. Called Alumblack, the material gives a soft or high gloss finish immediately upon application, about one minute is required for drying.

Alumblack is said to penetrate the metal surface so there is no measurable dimensional deviation. The material has some anti-corrosion properties.

Birchwood Chemical Co.
For more information, circle No. 213 on the Reader Service Card

For more information circle No. 51 on the Reader Service Card

STROH

HAS MOVED

Yes, after over half a century in one location we have expanded into a brand new building complete with the latest and most progressive facilities available.

The address is different but the techniques and know how which have made STROH one of the greatest names in the industry remain unchanged. May we point out to YOU the advantages of having STROH supply your zinc die castings?

Inquiries Invited

STROH DIE CASTING CO. INC.
11123 W. Burleigh St., Milwaukee 10, Wisconsin

MELTING ALUMINUM?

new, improved Haviland Flux for dry dross at lower operating temperature

Get greater metal-dross separation with our new, improved 4B Aluminum Flux. Safe and virtually smokeless, gives better alloys, makes pulverizing or mechanical separation unnecessary. Works *safely* in any type of furnace and at low temperatures (1250° F.) where other fluxes may fail.

OR ZINC?

Haviland 3G Zinc Flux gives complete dross separation, means greater metal savings – often *four times* greater. And you need *less* flux – sometimes 50% less. Completely safe. No acrid, stinging fumes to irritate employees.

DISTRIBUTORSHIPS STILL AVAILABLE

FREE TECHNICAL BULLETIN
gives important information on fluxing procedures and improved shop practice. Write for your copy.

Haviland PRODUCTS COMPANY
421 Ann Street, N.W. Grand Rapids 4, Michigan
Manufacturers of processing chemicals for the metal trades

For more information circle No. 30 on the Reader Service Card

HEAT CONTROL

continued from page 66

arise moreover, even where the *total volume* of alloy delivered to the die in any specified period, is the same as that in the preceding type of die.

The Remedy. The scale of heat variations occurring in a die of the latter kind can be minimized by the simple expedient of increasing the *mass* of metal in the tool. The effect of this modification would be to increase the heat-absorbing capacity of the die and reduce correspondingly the rate of heat dispersal by radiation to the outside air, or to the contiguous cooler platens and adjacent parts of the machine-frame. On the other hand, a die remedied by such an increase in its mass would have to be worked for a much longer period before its heat reached the stage of being stabilized within the desired optimum range of temperatures suited for best die casting production.

These two die examples illustrate a very important design consideration, that of correctly determining the relationship between the mass of the die and the volume of hot alloy injected and the speed of injection. This relationship has a considerable influence upon the general heating and working of the die, and the measure of control to be established.

In practice, this remedy of increasing the mass of metal in the die will not be possible except in vary rare instances: generally, the necessity for applying such a remedy will only be discovered *when the die has been completed* and subjected to actual running tests on the machine. Actually, the determination of proper wall thickness is achieved when designing the die before its basic features have been finalized. Such a selection should take into consideration an estimation of heat variations and control requirements.

Three other much more practicable ways are available to the die casting engineer for obtaining effective control over heat variations in the die:

1. By adding heat to the working die from some outside source.
2. By withdrawing heat from the die at a quicker rate than is accomplished solely by normal radiation or conductance. This is usually accomplished by cooling provisions installed in the die itself: a circulating water system or a flow of compressed-air.
3. By varying the extent of the critical radiative surfaces of the die without materially affecting its mass. The chief and most commonly adopted means of doing this are the provision of dummy runner-channels, over-flow wells, duplicate gating, or the formation of more extensive clearance lands on the parting-joint surfaces of the die.

Ordinarily, the first of these methods is only applicable for dies where the rate of *heat input* has to be substantially increased to *raise* die temperature up to the desired optimum working range.

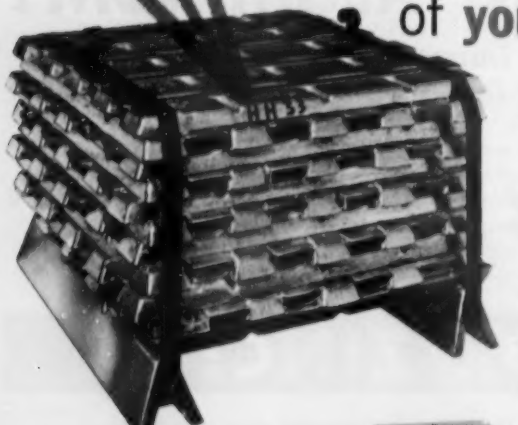
The second system will mainly be employed where the rate of *heat output* from the die has to be increased, so that its mean temperature will be *reduced* to the required optimum range of temperatures. The third means may be applied for either of the above purposes, and will be specially valuable for promoting good thermal balance throughout all critical portions of the die.

HH33

this heat number

on HENNING alloys

protects the quality of your product



Your Guarantee of Complete Inspection

The identifying number on each heat of HENNING Zamak alloy is your key to rigid quality control. Marked on each 2000-lb. pallet of hot bars as they come off the casting conveyor, the heat number is recorded along with all other pertinent information, such as furnace used, spectrographic analysis, etc. It is your guarantee that HENNING Zamak alloy has been thoroughly checked at every stage of production, that nothing has been left to chance, and that every heat will be precisely in accordance with your specifications.

- EACH ZAMAK BAR STAMPED TO IDENTIFY ALLOY
- SHIPPED ON CONSUMABLE SKIDS OF SAME ALLOY

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"DEPENDABLE SERVICE SINCE 1922"
91-117 Scott Avenue, Brooklyn 37, N. Y.

For more information circle No. 31 on the Reader Service Card

TITANIUM POWDER

continued from page 44

tective material in the compact, it would not permit removal of hydrogen which is evolved and pumped off during vacuum sintering.

It is necessary that hydrogen be removed and unless methods of powder production and handling can be devised which would keep hydrogen at 100-150 parts per million or less, it will be necessary to use vacuum equipment. It seems probable that with the continued general increase of utilization of vacuum equipment, its cost will be reduced and its use made easier.

Encouraging Prospects For Alloyed Titanium Powder

At the 1955 Metal Powder Association meeting, George Stern of American Electrometals, Inc. pointed out that powder metallurgy is often used to make alloys which cannot be made by other methods. He suggested that it would be worthwhile to find out whether such titanium alloys with desirable properties exist. Such an alloy conceivably might be the titanium analogy of sintered aluminum powder (SAP). Oxygen, or for that matter nitrogen, cannot be used as in the SAP process to produce powder coated with an insoluble constituent. However, other elements may be used to produce this coating and hence should be investigated.

In summary it can be said that unalloyed titanium powder metallurgy parts with desirable properties are being made. The prospects are good that higher strength parts can be made by the use of alloying elements. Powder metallurgy parts are being made in instances where manufacturing costs are lower than for present melting and fabrication techniques.

It seems reasonable to believe that there will be increased use of titanium powder metallurgy parts and that in addition the general increase in application of titanium will also be reflected in the powder metallurgy industry. The industry would be greatly assisted if an alloy with desirable properties, and producible only by powder metallurgical methods, could be developed.

Here's how 13 Twin City Castings prove LUCKY in this SCOTCH BRAND Tape dispenser

13 TWIN CITY CASTINGS USED IN TYPE "M" BOX SEALER

Here was a job that called for *more* than accurate dies and close-tolerance castings. It called for *co-operation* between designer and die caster . . . the kind of cooperation so important to creative manufacture.

Result: an extremely successful manually operated box sealer for use with Scotch brand cellophane tape. The unit is built by Specialty Manufacturing Company for Minnesota Mining and Manufacturing Co., manufacturers of Scotch tape. The dispenser contains 13 zinc die castings from complex main frame to small trip-pin arm . . . all *Twin City* die castings and *Twin City*-built dies.

If you have a particular die casting job, large or small, that calls for "cooperation" with your die caster . . . contact Twin City. Hundreds of manufacturers have found that it pays.

TWIN CITY DIE CASTINGS CO.
3351 TALMAGE AVE. S.E. • MINNEAPOLIS 14, MINN.

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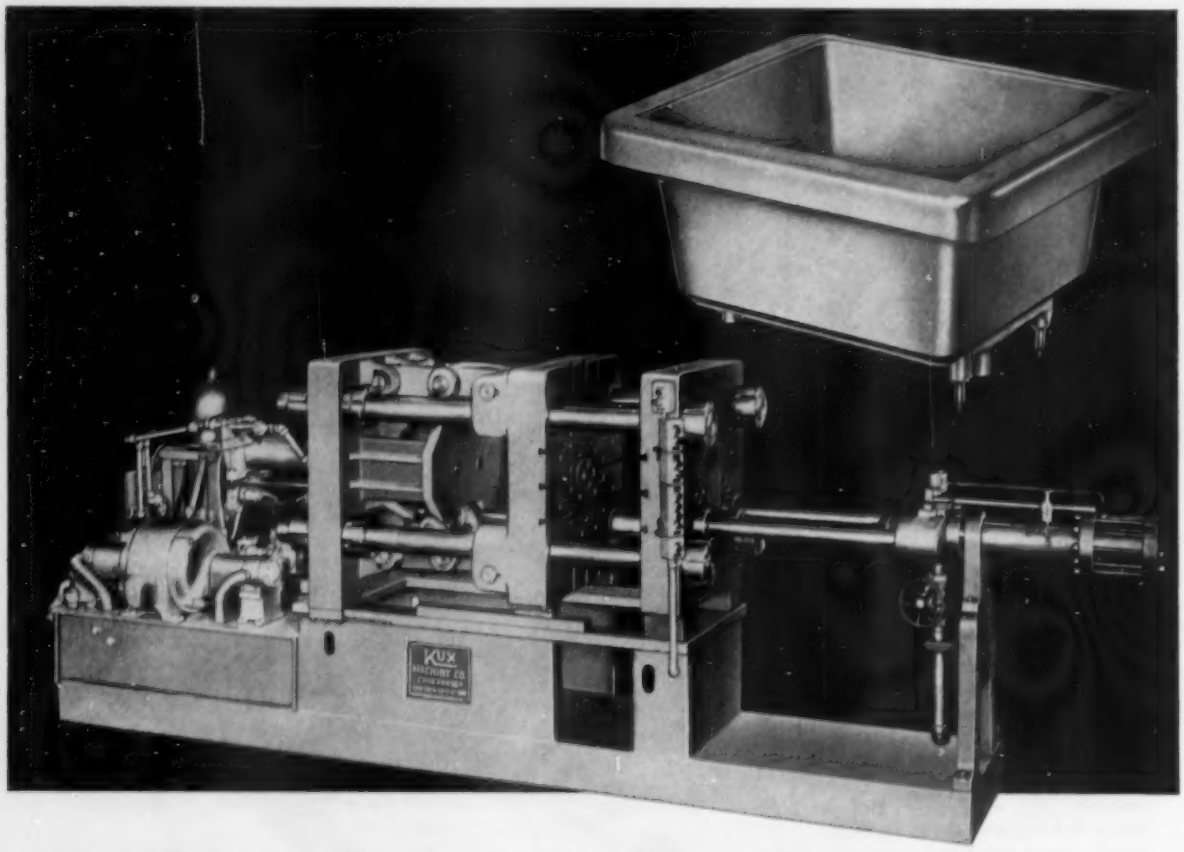
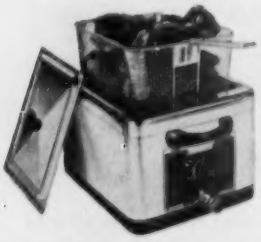


to get hardware finish quality castings with cast-in heating elements **EASTERN METAL PRODUCTS** *chose...*



KUX DIE CASTING MACHINES

for the Alcamatic Cooker and Deep Fry

"The die-cast well is the heart of our ALCAMATIC Cooker and Deep Fry and naturally must be of top-quality construction," says Mr. Seymour Troy, executive vice-president of Eastern Metal Products Corp., Tuckahoe, N.Y.

"The use of KUX machines (3 in the Forth Smith, Ark., plant and 4 in our Tuckahoe factory), plus our own production processing, enables us to provide the finest aluminum well, making the product an excellent working unit as well as an attractive appliance.

"KUX machines make the difficult problem of cast-in Calrod heating elements easy," Mr. Troy says, "plus cutting our production costs considerably.

"The hardware finish quality castings provided by KUX machines eliminates many polishing and finishing operations and leaves the fry well easy for the housewife to clean."

For the manufacture of electrical appliances requiring dense hardware finish quality castings, KUX die casting machines are unexcelled. Write for our NEW illustrated catalog.

MODEL HP-37 ILLUSTRATED

Hydraulically operated die casting machine for production of aluminum castings.

KUX MACHINE CO. 6725 NORTH RIDGE AVENUE • CHICAGO 26, ILLINOIS

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NEWS OF INDUSTRY & ASSOCIATIONS

activities of people, companies & groups included in the precision metal molding industries

LUX CLOCK MANUFACTURING CO. MAKES POWDERED METAL PARTS AS JOBBING PRODUCER

The Lux Clock Manufacturing Co., Waterbury, Conn., for many years producers of powdered metal parts for incorporation in their own clocks, timers and synchronous motors, has announced expansion of its operations to handle the manufacture of a wide variety of such parts for other original equipment manufacturers.

Commenting on the move, Fred Lux, president, pointed out that the company is far from being a newcomer to the powdered metal parts field. "In fact," he stated, "We were among the first concerns in the country to foresee the possibilities of this method and explore them commercially."

Lux is offering a complete service to users of powdered metal parts. In addition to furnishing the design engineering assistance often required in adapting conventional parts to more economical powdered metal parts, Lux has complete facilities for performing secondary operations and is equipped to handle sub-assembly.

HARRY C. AHL APPOINTED TECHNICAL DIRECTOR

Harry C. Ahl

New technical director of Samuel Greenfield Co., Inc., Buffalo, N.Y., is Harry C. Ahl. In his new position, he will be director of laboratories, charged with all new alloy development and plant metallurgical control. He will also be in charge of foundry technical services.

Mr. Ahl was formerly division project engineer for the National Bearing Division, American Brakeshoe Co., at Meadville, Pa. He is national chairman of the Brass and Bronze Division of the American Foundrymen's Society.

During the Korean action, he was non-ferrous materials assistant to the chief, Bureau of Ships, Navy Department.

ALLOY PRECISION LEASES NEW PLANT

A new 23,000 square feet plant at 3855 West 150th St. in Cleveland, Ohio, has been leased by Alloy Precision Castings Company, manufacturer of investment castings, it has been announced by Frank W. Glaser, executive vice president and general manager.

Operations in the new plant will begin on July 15, and all production facilities from Alloy Precision Castings Company's factories at East 45th and Hamilton Ave. and 13721 Bennington Ave., both in Cleveland, are being moved to the new plant.

DU-WEL EXPANDS DIE CASTING PLANT

Scheduled for completion on July 1 is a 2800 square foot addition to the die casting plant of Du-Wel Metal Products Co., Bangor, Mich. The extra space which adjoins the main structure will be used primarily for the storage of finished castings. This, plant officials say, will permit the storing of more castings during slower months and permit a more uniform factory work load.

Also part of the general plant improvement program is a new monorail conveyor, 800 feet long, moving from the casting department to the machining department.

VACUUM METALS CORP. APPOINTS TWO MANAGERS

Two appointments have been announced by James H. Moore, general manager of Vacuum Metals Corp., jointly owned by Crucible Steel Company of America and National Research Corp.

Frank J. Coates has been named sales manager of Vacuum Metals

Frank J. Coates

Corp., and Arthur E. Franks has been named manager of operations. Christopher S. Houghton, formerly operating practices engineer, replaces Mr. Franks as superintendent of melting.

Mr. Coates, a graduate of University of Michigan, has a long record of experience in the field of high temperature alloy and stainless steel sales.

Mr. Franks, a metallurgical engineering graduate from Rennselaer Polytechnic Institute, has been associated in engineering capacities with the Central Aircraft Laboratory of GM's Chevrolet Div., the General Electric Co., and Indiana Steel Products Co. He has been with VMC since 1949.

Mr. Houghton, also an RPI graduate, has been with Vacuum Metals since 1952, following employment by Morse Twist Drill & Machine, F. S. Gibbs, and Bird Machine Co.

The staff expansion, according to Mr. Moore, is necessitated by the company's new 2200 lb. vacuum melting furnace, together with their 600 and 300 lb. furnaces, all of which are operating at capacity.

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For Outstanding Structural Parts, Porous Media and Self-Lubricating Parts Requiring Any or All of These Properties . . .

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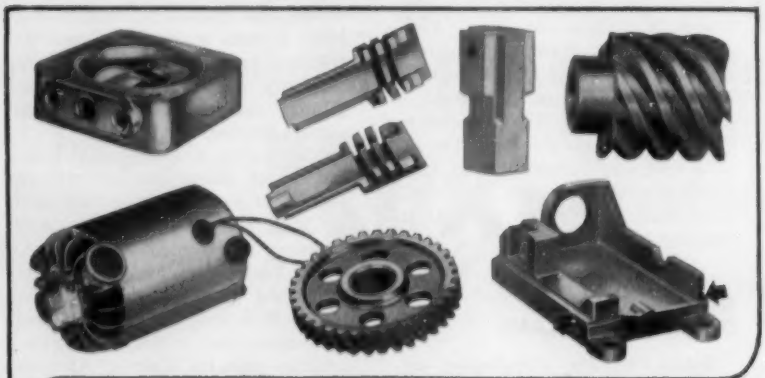

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Established 1909

For more information circle No. 41 on the Reader Service Card

EXPAND SALES FORCE

Hoeganaes Sponge Iron Corp., Riverton, N. J., recently announced plans for sales force expansion program to increase their service to all metal powders markets.

The Hoeganaes plant manufactures metal powders for powder metallurgy, cutting and scarfing, chemical field, plastics industry, atomic energy and as iron coatings for welding electrodes.

Recently appointed to their sales staff; Fred W. Bulach servicing Pennsylvania, New York and Maryland; John K. Grube to Wisconsin and Illinois; E. M. Lannes for Ohio, Michigan and Indiana; J. K. Taylor in Southern Ohio and Kentucky; and W. C. Gibbs as sales representative in Alabama, Mississippi and Tennessee.

HITCHINER BUILDS NEW FOUNDRY SECTION

John Morison, president, Hitchiner Manufacturing Co., Milford, New Hampshire, announces that the company is again expanding its facilities to enable it to meet the increased demand for the investment castings which the company makes.

The new addition will house the foundry section. This move will provide space for all present equipment and new equipment is on order that will double the steel casting capacity. The heat treating department, which, too, is being enlarged, will also occupy space in the new area. The space made available by these moves into new quarters will be used to relieve overcrowding and provide increased capacity for other departments in the present building.

This anticipated increase in production makes it necessary to purchase additional machine tools and materials handling equipment and orders have been placed so that deliveries will coincide with the completion of the building. It is anticipated that production under the new set-up will start in August.

SPEED-D-BURR BUILDS NEW FACTORY

Ground has been acquired and construction work will begin soon on a new factory for the Speed-D-Burr Corp., Glendale, Calif. according to Haskell J. Miller, president of Speed-D-Burr.

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1085 **STANDARD SIZES** of OILITE self-lubricating bronze bearings now are available to you through your local OILITE Dealer.

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You'll want the new OILITE Bearing Stock List S-56 which gives the 1085 standard OILITE bronze bearing sizes and the complete list of OILITE bronze cored, bar and plate material from stock. It's free! Write us today or phone your local dealer. He is listed in the Yellow Pages of your telephone book under "Bearings—OILITE."

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CHRYSLER CORPORATION • DETROIT 31, MICHIGAN

Bearings • Finished Machine Parts • Permanent Metal Filters • Friction Units

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RENAME STOKES COMPANY

F. J. Stokes Machine Company, Philadelphia, Pa., has changed its name to F. J. Stokes Corporation effective July 1, Francis Dougherty, Stokes' president, has announced.

PRECISION HOUSINGS

continued from page 35

Sand casting: Using a slightly revised design better adapted to sand casting, a pattern cost of $76 was established and casting costs quoted at $1 each with no price break until 250 pieces, when the price dropped to $.50. Subsequent machining needed would amount to $12.60 per part. Five weeks was required for delivery.

Die casting: Again, slightly modifying the design, to get the most effective use of the die casting process, the cost of a single cavity die was estimated at $650. For runs of fewer than 1000 pieces a casting price of $.75 was quoted, with a setup charge of $25 on the run. Subsequent machining was quoted at $4.80 per part, with delivery to start six weeks from the start of die construction.

Investment casting: Tooling costs for investment casting were $240, and the cost of individual castings $4.10. Because of the closeness of cast dimensions, subsequent machining cost was only $2.80 each. This method was finally selected as the method of producing the housings, and Humphrey Castings, Inc., who quoted the job, delivered first castings five days after die construction started, and final delivery in ten days. Another eight days of machining brought the total time to 18 days.

IN THE WEST IT'S . . .

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When you buy your die castings from Universal, you are gaining the services of experienced die casting engineers, die designers, production men and management. You are putting a well-equipped shop to work on your castings. You will find, as hundreds of other companies have, that you can depend upon Universal for quality, service, delivery and prices that will help keep your own production costs down.

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SMALL DIE CASTINGS

continued from page 36

the shoulder to the face of the flange is cast to .571 ±.002, while the tapered, threaded shank is cast with a base diameter of .311 ±.001.

In another case, where a machined brass pinion has been replaced with a die cast zinc one, the bore is still held to .047 ± .001 while the total concentricity on three diameters, center hole and OD is held within ± .004 TIR.

Although the stamped and screw machined components were procured from outside jobbing sources, just as the die castings are, the changeover has resulted in a reduction in the number of in-plant operations. Many secondary machining and assembling operations have now been eliminated. Frequently, this represents the difference in cost between finished pieces.

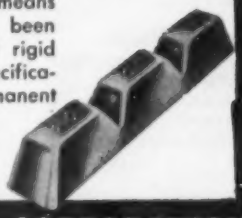
One major problem eliminated by the introduction of die cast pinions in place of machined ones has been the deburring of gear faces. The presence of small burrs on cut gears could not only disturb the accurate operation of the timers, but could actually damage its components. Most of the die cast pinions are produced with shoulders. This not only simplifies die design, but also allows the production of gears that are free of burrs. When the peripheral flash is trimmed off by the die caster, it removes all excess metal. Deburring is not needed.

G-E, now building additional plant facilities in Burlington, Ia., to meet the demand for its line of appliance timers and related controls, will continue to use die cast components, choosing them principally on a competitive-price basis, but also for certain functional improvements.

For more information circle No. 49 on the Reader Service Card

When You Think of ALUMINUM BRASS & BRONZE Think of Sonken Galamba

The initials "S-G" on aluminum, brass or bronze ingot means uniform quality that has been produced to meet the most rigid chemical and physical specifications. Whether it's for permanent mold, sand or die cast, you can be confident with "S-G" ingot.



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Any way you look at it—you save and gain with Procunier Tappers. Countless reports indicate tremendous savings on taps, automatic production increases, drastic reduction in parts spoilage, less operator fatigue, fewer "down hours" and precision accuracy in threads and tapped holes. Taking these gains and savings into consideration you can quickly see why Procunier heads "pay for themselves in just a short time!"

Procunier heads offer high speed, quiet operation, a new, powerful drive—with finger tip pressure; economical lightness, "long life" ruggedness and an accuracy and dependability you can consistently count upon! And, there's a versatile model for practically every tapping operation.

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House —your Products

with

ALUMINUM or MAGNESIUM DIE CASTINGS

Pictured here is an aluminum die cast adding machine housing produced by LITEMETAL for a major manufacturer in the office equipment field. It typifies the practicability and economy offered through die castings of the new lightweight aluminum and magnesium alloys—which make "portability" possible. Housings, shrouds and covers for many types of equipment, when die cast, are smooth, eye-appealing and merchandisable.

Meeting competitive situations, great cost savings are effected through the virtual elimination of labor otherwise required for machining, finishing and assembling; also provided are mounting bosses, lugs and cored holes. Die castings such as these are mechanically strong and dependable—readily accept desired finishes. Important are the savings in weight which greatly facilitate handling during the manufacturing processes and effect reductions in shipping costs.

Let's Talk It Over . . .

LITEMETAL DICAST, INC. is an organization of specialists — men thoroughly experienced in the casting and machining of magnesium and aluminum alloys. Our equipment includes big machines for big jobs — little machines for little jobs . . . the right sizes and types of the most modern die casting equipment for producing parts from the size of a button to large cable spools. Complete facilities for secondary operations are also available.

Write today for literature and design information. Quick action on inquiries.

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A.B.C. DIE CASTING
MACHINE

Free Cycles Over 1000 Shots Per Hour

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The A·B·C is economical to operate and easy to set up. Its lightning production speeds makes single cavity molds practical and profitable.

STANDARD EQUIPMENT INCLUDES:
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- GAS BURNERS
- DIE BLOCKS
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A B C

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POWDERED METAL PARTS — Nationally operated manufacturers' representation organization, located in Southern Ohio, needs a source for powdered metal parts. Write Box No. 7156.

WALTER BONSACK JOINS WM. F. JOBBINS STAFF

Walter Bonsack, for many years a metallurgist and consultant in the foundry industry, has joined the staff of William F. Jobbins, Inc., Aurora, Ill., as special metallurgical consultant and sales engineer in the West Coast area. Mr. Bonsack will be located at 12619 Killion St., North Hollywood, Cal.

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parts

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high strength • corrosion and abrasion resistance • fine finish

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What's more, REXALLOY parts can be produced to close tolerances, in almost any shape, by either investment, sand, or the new shell-mold casting process. Finishing operations are practically eliminated—costs substantially reduced.

Check on the advantages one of the many types of REXALLOY castings has for your product. Your Crucible representative will give you all the facts. *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

CRUCIBLE first name in special purpose steels

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SPECIAL HIGH GRADE ZINC — 99.99%
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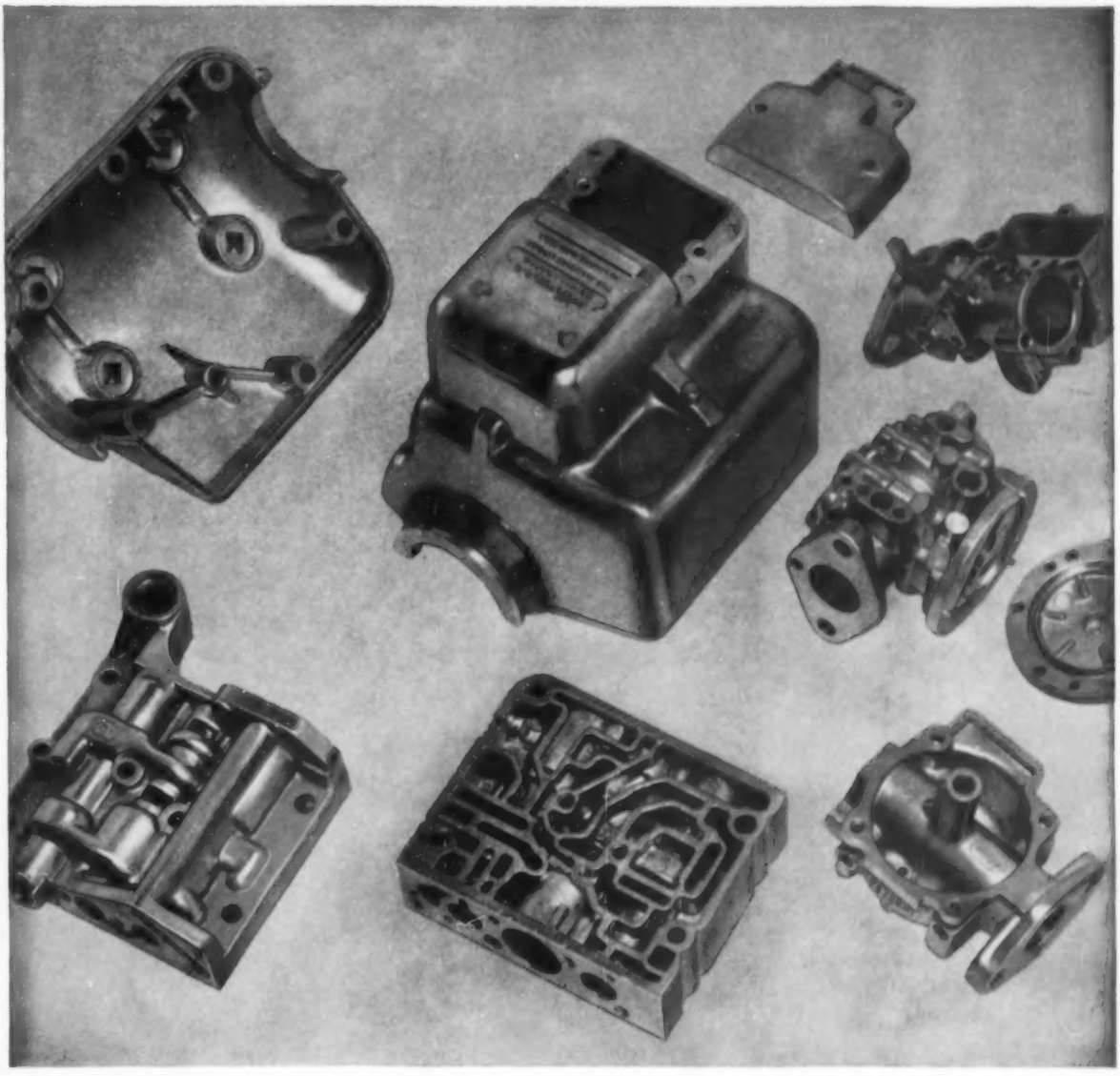

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Since 1922, veteran Hoover design engineers, X-ray and metallurgical technicians have been constantly developing better zinc and aluminum alloys, improved die designs, and more efficient production methods. The experience and techniques developed through these years produces superior castings—at greater savings.

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Why not write and ask to have a Hoover Sales Engineer pay you a call? Write, too, for your copy of "Hoover Die Castings," an informative booklet of THE HOOVER COMPANY, Die Castings Division, North Canton, Ohio.

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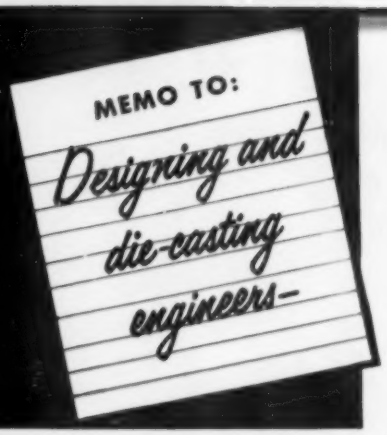

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aluminum die casting alloy

...with 11 percent silicon

Send for our helpful booklet, "Die Casting Alloys." Shows composition, properties, other data on Apex products. No obligation.

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